a journal for precision engineers and all users of industrial diamonds and other hard materials

INDUSTRIAL DIAMOND REVIEW

incorporating INDUSTRIAL DIAMOND ABSTRACTS

MONTHLY 1/3 SUBSCRIPTION 15/- A YEAR

October, 1959 Vol. 19 No. 227

D. S. I. R.
National Lending Library for Science and Technology.
4450
NATIONAL ENGINEERING LABORATORY
30 OCT 1959
LIBRARY

AUSTRALIA
BENELUX
BRAZIL
BRITISH GUIANA
CANADA
FRANCE
GREAT BRITAIN
INDIA
ITALY
JAPAN
NEW ZEALAND
SCANDINAVIA
SPAIN
SWITZERLAND

Triefus

INDUSTRIAL DIAMONDS
TRIEFUS & CO. LTD.,
THAVIES INN HOUSE, 4, HOLBORN CIRCUS,
LONDON, E.C.I, ENGLAND
Telephone : FLEet Street 9741 Cables : Triefus, London

DIAMOND PRODUCTS
TRIEFUS INDUSTRIES LTD.,
MANOR ROYAL, CRAWLEY, SUSSEX, ENGLAND
Telephone : Crawley 2244 Cables : Triefus, Crawley
DRILL BITS DIAMOND TOOLS
DIAMOND MICRO-POWDERS

INDUSTRIAL DIAMOND COMPANY (SALES) LTD.

INDUSTRIAL

DIAMONDS

FOR ALL

APPLICATIONS

ENQUIRIES INVITED

88/90 · HATTON GARDEN · LONDON · E·C·1

Telephone: HOLBORN 2642/2247 *Telegrams:* IDECE, LONDON

Do you use Wheel Forming attachments?

This is an enlarged reproduction of the tool to show detail.

We can supply all types of chisel tools for any of the high accuracy form dressing attachments. Diamonds of a special type are used. They have the ability to resist wear and maintain their size for long periods. Accurate setting and close tolerances of the diamond radius guarantee both long life and consistent operation.

SUPER MATERIAM IGNIS TRIUMPHANS

Est 1828

J. K. SMIT & SONS (DIAMOND TOOLS) LTD.

22-24, Ely Place, Holborn Circus, London, E.C.1.

Telephone: ★ HOLborn 6451. *Cables:* Carbonsmit, London.

International Organisation:

J. K. Smit & Zonen Diamantgereedschappen (Diamond Tools) N.V., 66, Sarphatistraat, Amsterdam C, Holland
J. K. Smit & Fils, S.A., 28-30 Rue du Docteur Bauer, Saint-Ouen (Seine), France
J. K. Smit & Sons, Inc., Murray Hill, New Jersey, U.S.A.
J. K. Smit & Sons of Canada Ltd., 81, Tycos Drive, Toronto 19, Ontario, Canada
J. K. Smit & Sons (Australia) Pty. Ltd., Chesterville Road, P.O. Box 68, Moorabbin, Victoria, Australia

MICROSTRUCTURES OF DIAMOND SURFACES

By S. Tolansky, D.Sc., F.R.S.

Read what the Reviewers say about this important book :—

This is a delightful book : firstly because it is a record of a piece of highly individual research by one school supervised and inspired by one man ; secondly, because it is superbly illustrated. Indeed, although the letterpress is easy to read, the ideas being clearly and simply expressed, it is probably the plates that will sell the book . . . Prof. Tolansky has developed new and very powerful optical techniques which actually reveal and enable him to measure surface steps or discontinuities of as little as 10 A., the effective useful magnification in such a case being X 500,000. . . . Cleavage, polishing, etching and sawing of diamond faces, octahedral, cubic, and dodecahedral, are all discussed in the light of really remarkable photographs, and some information is given on the difficult problem of " the two types of diamond."—Kathleen Lonsdale in " Science Progress."

Prof. Tolansky has been well served by the Goldsmiths' Press, whose wide experiences of diamond publishing has doubtless contributed to the success with which they have reproduced so many of his magnificent photographs of diamond surfaces. . . . Although all these methods are simple applications of well-known optical principles, it has remained for Prof. Tolansky to develop them into an extraordinary powerful array, needing skill to be sure, for their successful application, but comparatively little equipment beyond a good optical microscope to obtain one-dimensional resolution which compares favourably with that of the electron microscope. . . . The appearance of this book will be a welcome stimulant to many engaged in diamond research. It also provides valuable data for comparison with the artificial crystals of germanium and silicon, on which such an immense amount of effort is now being expended by the electrical industry. Since the stages of growth can actually be followed for these metals, comparative studies might well resolve some of the fascinating problems so literally brought to light by Prof. Tolansky's researches.—H. J. Grenville-Wells in " Laboratory Practice."

To those who use diamond as a tool, the information in the last two chapters, on " ring-crack " damage to diamonds, and on the surface condition of mechanically polished diamonds, should be specially worthy of study."—F. C. Franks.

Some of the traditionally accepted facts about diamond surfaces have been contradicted by Prof. Tolansky since he began studying the gem in his laboratory. His recent observations are described in " Microstructures of Diamond Surfaces." He reports, for instance, that tradition has it that diamonds have a perfect cleavage in particular directions. From optical studies of cleavage surfaces he says that " the cleavage is optically very far from perfect except in one type of diamond."—" Tooling and Production," Huebner Publications Inc.

CONTENTS

The Optical Techniques
Some Characteristics of Diamond
The Topography of the Natural Octahedron Faces
The Nature of the Trigons
Some Growth Features on Octahedron Faces
Linear Discontinuities on Diamonds (Slip ?)
The Etching of Diamond
Diamond Cleavage
Optical Shadow Casting
Percussion (pressure) Marks on Diamond
Polished Diamonds
143 *Special Art Plates*

NO LIBRARY ON DIAMOND IS COMPLETE WITHOUT THIS ESSENTIAL BOOK

ORDER FORM

To Book Department, NAG Press Ltd.,
226 Latymer Court, Hammersmith, London, W.6.

Please send me .....copies of " Microstructures of Diamond Surfaces," by Professor Tolansky.

Name .....

Address .....

40/- per copy, 41/6 by post. £.....enclosed.
$8.50 in U.S.A. and Canada.

Distributed in U.S.A. and Canada by Huebner Publications Inc., 1975 Lee Road, Cleveland, Ohio.

Exporters

WOLVERHAMPTON
DIAMOND DIE
& TOOL CO. LTD.

ALL GRADES OF
BOARTS AND INDUSTRIAL DIAMONDS

11 HATTON GARDEN LONDON E.C.1

TELEPHONE HOLBORN 3017 CABLE PARDIMON LONDON

DIAMANT BOART

DIAMOND IMPREGNATED TOOLS
ARE USED ALL OVER THE WORLD

Wheels

Saws

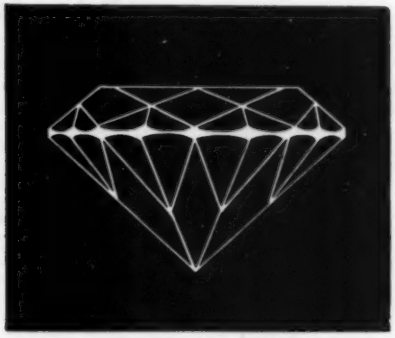
Drill Bits

Truing and dressing tools ∴ Hones Boring Crowns
Dental Tools

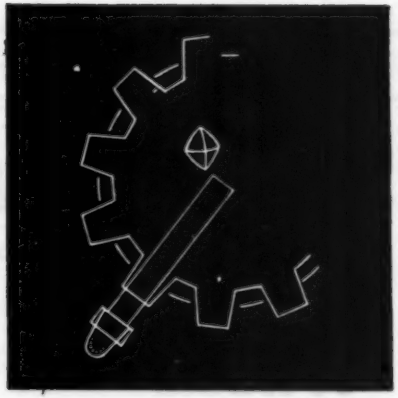
74, avenue du Pont de Luttre, Brussels, Belgium
Sole representative in U.K.: **Compentrad Ltd, 31, Throgmorton Street, London, E.C.2**

D. DRUKKER & ZN. N.V.

SPECIALISTS in
INDUSTRIAL DIAMONDS
cleaving and sorting



diamonds in art and industry



amsterdam, holland.
12 sarphatikade

phone : **67321** (3 lines)
cable : **DUBBELDEE.**

If you are interested in our products please visit our works

INDUSTRIAL DIAMOND REVIEW

Vol 19 No 227
OCTOBER 1959

Editor-in-Chief :
Eric M. Bruton

Managing Editor :
Patrick Greene

★

© 1959 *N.A.G. Press Ltd.—All rights reserved.*

PRINCIPAL CONTENTS

Generally Speaking — **Adamant** 185

The Practical Realization of the HV and HR Scales — **R. S. Marriner** 186

A Film for Recording the Reactions in the Diamond Wheel Structure — **K. E. Schwartz** 195

★

Industrial Diamond Review is published monthly at 1s 3d per copy, and is obtainable through newsagents and booksellers or by postal subscription (15s yearly, post free). Subscriptions in the United States of America are $2.50, and can be entered through the usual subscription agencies or direct through the publishers :—

N.A.G. Press Ltd
226 Latymer Court
London W.6.
(Telephone : RIVerside 2143).

★

Contributions of scientific, technical and practical interest, and news items, are invited, but responsibility cannot be accepted for the safety of MSS, drawings, photographs or other matter submitted. Material not accepted will be returned.

★

All editorial communications should be made to the Managing Editor at
2 Charterhouse Street
London E.C.1
(Telephone : FLEet Street 1577)

Printed by
Martin's Printing Works Ltd., Berwick-upon-Tweed, England

Generally Speaking

Exhibitions—Permanent and otherwise

It is a symptom of the ever increasing interest in the diamond as an industrial material that even where an exhibition is nominally devoted to gems, a section devoted to industrial stones is frequently included nowadays. The 'Ageless Diamond' exhibition held at Christie's Salerooms in London earlier this year is a case in point, and the Italian International Jewelry and Silverware Fair, taking place at Milan from the 12th to the 27th of November is another. As mentioned in the Industrial Diamond Review previously, both the diamond section of the Milan exhibition and the double exhibition, of gemstones, and industrial diamonds to be held in Birmingham in February and March, 1960, are sponsored, like the Christie's exhibition, by De Beers.

A permanent exhibition of diamonds, both gem and industrial, is to be seen in London, at 2, Charterhouse Street. Not only are the diamonds themselves—both rough and worked—to be seen, but there are also dioramas and models of the diamond mines and the associated industries, and facilities for showing films. Individuals and parties—up to, say, a dozen—who wish to see this exhibition, should apply in the first instance to the Editor for an appointment.

Any Other Symptoms?

The questions referred to the *Industrial Diamond Review*, both in their scope and in the widely distributed geographical location of the senders, are a further indication of the spreading interest in industrial diamonds. It is especially interesting to notice that, in the past two years, there has been a number of instances of students—not necessarily engineering students, but teachers, arts students, and accountants—having chosen the diamond industry as a subject for analysis. They have written to us for information, and we have been pleased to help them as far as possible,

Continued on p. 199

The Practical Realization of the HV and HR Scales

by **R. S. Marriner**

— **Communication from the National Physical Laboratory** —

Summary

Experiments with precise indentation hardness testing machines are described in which the conditions of loading the indenter are varied and the resulting variations in the hardness values obtained are discussed. Evidence of the necessity for precise control of the loading conditions in standardization work is given, together with the definition and accuracy of the HV scale of hardness provided by the National Physical Laboratory.

Introduction

The definitions of both the Diamond Pyramid (HV) and Rockwell (HRC and HRB) indentation hardness tests are simple to enunciate but when their practical interpretation is attempted, using hardness testing machines which purport to load the diamond or ball indenter in the prescribed manner, it is found that machines, even of the same design, can give appreciably different hardness values for the same test specimen. It is therefore traditional practice in the industrial measurement of hardness to verify the machines used by means of standard test blocks. The onus of realizing the definitions in precise practical form thus falls on the limited number of manufacturers and standardizing laboratories throughout the world which accept responsibility for calibrating the standard test blocks.

Of necessity, the standards of hardness provided by each of these authorities are vested in the particular machines which they use, and it has become increasingly apparent, particularly in the Rockwell C scale, that the scales of hardness given by these machines are not in sufficiently good agreement to satisfy present industrial needs. As one of the responsible standardizing laboratories, the National Physical Laboratory has been studying the problems involved with the object of establishing impeccable standards for the HV and HRC scales.

Initially, primary attention was given to the Rockwell scale, where the major lack of agreement exists. Experimental investigation of the influence of the diamond indenter[1] revealed the substantial errors introduced by quite small departures from the postulated form[2]. During this investigation, which was made by means of a deadweight Rockwell type machine built at the Laboratory about fourteen years ago, it became evident that it would be necessary to design and build a new deadweight machine incorporating modern techniques and having the necessary facilities for the fullest possible control of the indenting procedure. This machine would then constitute the Laboratory's standard for measurements of hardness in terms of the Rockwell C and B scales.

The design evolved for the new machine included a number of novel features which it seemed wise to test experimentally beforehand. Since these features were common to the simpler Vickers type deadweight machine, which it was also planned to build, it was decided to proceed first with the construction of the Vickers machine. A description of this machine has been published[3]. The design proved eminently satisfactory and has therefore been accepted for the deadweight Rockwell type machine which is now in course of construction.

Evaluation of the precision of a standard hardness testing machine is seriously hindered by lack of uniformity of hardness in the test blocks used, since it is impossible to distinguish variability due to the block from variability due to the machine. All commercially available hardness test blocks—and they were sought throughout the world—showed a lack of uniformity which seriously impeded progress, and it became necessary to develop at the Laboratory techniques which would provide test blocks sufficiently uniform in hardness to ensure a reliable basis for the experimental work envisaged. The new deadweight Vickers machine was of great value in this work which made it possible to produce blocks covering the range 950 to 200 HV with a uniformity of hardness to within 1% of their hardness value at the hard end of the range and within 2% at the soft end[4].

With the aid of these uniform blocks it became practicable to investigate precisely, and in detail, the performance of the deadweight Vickers machine. Such effects as misalignment of the

indenter, imperfections in its form, and error in the load applied, have been examined. In particular, measurements have been made to determine the influence on the hardness measurement of speed and duration of loading. The results of some of the experiments made with this new machine and with an experimental Rockwell machine, together with the conclusions that the Laboratory has reached in regard to the definitions and accuracy of the standards of hardness which it will maintain, are the subject of this article.

Mis-alignment of the indenter

An important design feature of the new Vickers machine is the free suspension of the load on the indenter, which ensures that there is no loss of load due to friction from guides[3]. The lack of guides necessitates careful balancing of the load so that the indenter does not become inclined to its direction of movement during the penetration of the specimen and thus deform the indentation. An inclination effect of this kind can occur in conventional type testing machines if the plunger which carries the indenter moves in guides which are not straight or if clearances are too large and the indenter becomes inclined as the load is applied.

An experiment was made in which the balance of the 30 kgf load was disturbed by different amounts and thus the inclination of the indenter during penetration was varied. It was found that a change in inclination of 10 seconds of arc was necessary before a change of hardness value of 3 HV could be detected on a test block of hardness 950 HV. As the balance of the loads on this machine can be set easily to give repetition within 2 seconds of arc it was concluded that errors from this source would be negligible.

Because of the lack of guides, out of balance forces can rotate the load and indenter about the indenter's axis during penetration, and care was taken in the design and manufacture to ensure that rotation during penetration would be negligible. To investigate the effect of rotation of the indenter, groups of indentations were made in which the indenter was deliberately rotated by increasing amounts. It was found that to produce a detectable change in hardness value, the rotation had to be sufficient to produce obvious rounding of the corners when the indentation was viewed in the measuring microscope. It was concluded from this experiment that provided the corners of an indentation appear sharp then no appreciable error can have been introduced due to rotation of the indenter.

Error in load

To determine practically the magnitude of errors in hardness value due to errors in load, groups of ten indentations were made on a test block with small additional loads attached to the standard load of 30 kgf. The loads used and the mean size of the diagonals of the groups of ten indentations are given in Table I. Column 3 of the table gives the hardness values for the block as calculated from the known loads and the mean measured diagonals, whilst column 4 shows the hardness values determined from the mean measured diagonals and an assumed constant load of 30 kgf. Finally, the expected values for the mean diagonals computed from the mean hardness value and the known loads are shown in column 5.

The following deductions may be drawn from Table I:—

(*i*) The hardness values obtained for the block (col 3) are in remarkable agreement over the range of loads used. This agreement not only demonstrates that, for heavy

TABLE I

Hardness value and error in load

1	2	3	4	5
Load (P) (kfg)	**Mean diagonal (d) (micro-m)**	**$HV = \frac{2.P.\sin\theta/2}{d^2}$ (HV)**	**$HV = \frac{2.30.\sin\theta/2}{d^2}$ (HV)**	**$d = \left(\frac{2.P.\sin\theta/2}{880.2}\right)^{\frac{1}{2}}$ (micro-m)**
30.00	251.4	880.2	880.2	251.4
30.30	252.6	880.6	871.9	252.7
30.60	254.0	879.5	862.3	253.9
31.50	257.6	880.3	838.4	257.6

loads, the hardness value is independent of the load used, but also indicates the precision of this indentation hardness test and the reliability of the mean of ten indentations on a test block whose total variability is about 12 HV.

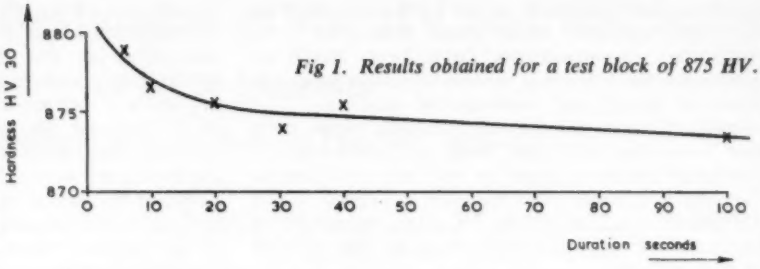


Fig 1. Results obtained for a test block of 875 HV.

(ii) Col 4 shows that for this standard load and level of hardness, an error of 35 gmf in the load introduces an error of 1 HV in the hardness value obtained. In round figures, 0.1% error in load is equivalent to 1 HV at this level, and is the maximum load error which should be permitted in good industrial machines.

(iii) Col 5 shows the expected values for the mean diagonals, and these depart from the observed values by only 0.1 micro-m. This agreement demonstrates the accuracy that can be attained in indentation hardness testing, and is typical of the accuracy that has been obtained in a number of experiments with the apparatus at the Laboratory.

Duration of full load

Ancillary pneumatic equipment in the standard indenting machine indicates precisely the moment when the full load is applied to or removed from the specimen, and the design of the machine permits the duration of the full load to be varied independently of all other conditions of test.[3] To determine the effect of the duration of the full load upon the hardness value obtained, experiments were carried out in which groups of ten indentations were made on a test block under identical conditions of test except that the duration of the full load was changed for each group of indentations.

The results obtained for two test blocks of hardness 875 HV and 220 HV are shown in Fig 1 and 2 where the mean hardness value obtained for each group of ten indentations is plotted against the duration of the full load. It will be seen that for the harder test block, Fig 1, the curve rises appreciably for durations less than 20 seconds, but for durations between 30 and 100 seconds—although static equilibrium may not have been attained—the change of hardness value is in the neighbourhood of only 1 HV. Such results indicate that for hard specimens the minimum duration for the full load should be 30 seconds. However, Fig 2 shows that for a soft test block static equilibrium is not achieved for at least 2 minutes after the application of the full load. Even for calibration work this is an excessively long time to maintain the full load both from an economic point of view and the difficulty of ensuring complete freedom from external vibration.

The results are in agreement with the readily acceptable fact that the time required to achieve static equilibrium after the full load is applied is proportional to the load used and inversely proportional to the hardness of the test specimen. It may therefore be expected that the effect will be even greater in the Rockwell C test where the full load is 150 kgf, and users of this test are aware of the considerable creep of the indicator when the full load is applied to soft specimens.

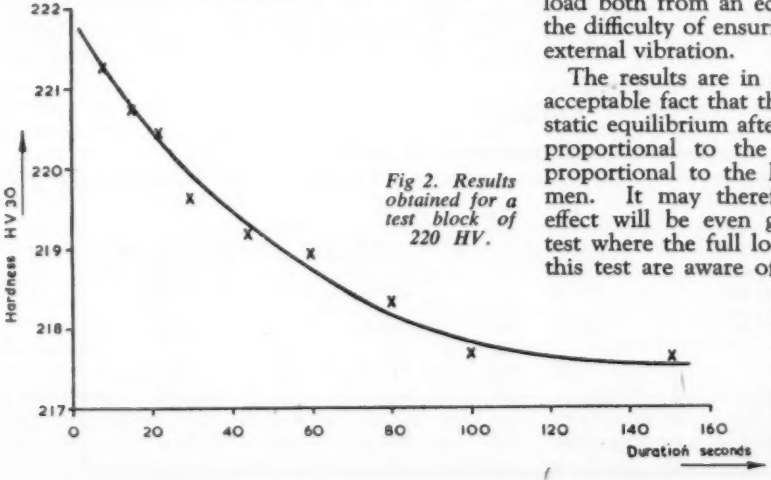


Fig 2. Results obtained for a test block of 220 HV.

It will be apparent from these results that agreement between the different standardizing authorities will not be reached unless the defini-

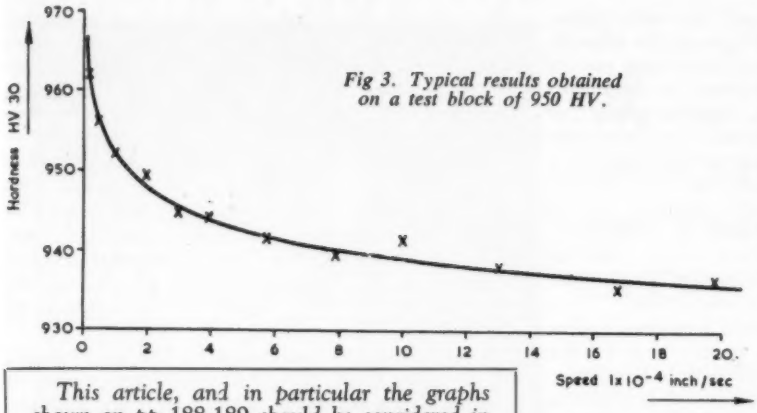


Fig 3. Typical results obtained on a test block of 950 HV.

This article, and in particular the graphs shown on pp 188-189 should be considered in conjunction with the article 'Test blocks for indentation hardness testing' by Mrs. J. G. Wood, published on pp 166-170 of Industrial Diamond Review, September 1959.

tions of the indentation hardness tests specify precise limits for the duration of the full load.

Speed of loading

A prime consideration in the design of industrial indentation hardness testing machines is that the hardness test shall be carried out in a minimum of time but without undue loss of accuracy. To achieve a short cycle of operation without introducing impulsive forces, the loading mechanism is usually designed so that the rate of penetration of the indenter is high in the initial stages but diminishes to near zero values as the resistance to penetration increases and the indentation is nearly completed. In the majority of machines there is a final stage in the indenting process which occurs when the load controlling mechanism becomes clear of the load before the resistance to penetration is equal to the full load. In such machines the full load is applied a little before the indentation is completed, and penetration continues at a diminishing rate until static equilibrium is achieved or the load is removed.

That such a stage must exist is revealed by Fig 2. A machine which has a complete cycle of operation of, say, 20 seconds, and is also designed so that the load controlling mechanism becomes clear of the load during this cycle, must transfer the full load to the specimen before penetration is complete if the characteristics of the specimen will not permit the attainment of static equilibrium within 20 seconds. The important consequence of this final stage of the indenting process is that the full load is transferred to the test block at a finite velocity and the hardness value obtained is dependent on this velocity.

As rapid hardness testing was not a prime requisite for the Laboratory's standard machine, it was designed so that the load could be applied at a uniform velocity whilst under control of the load applying mechanism. This velocity can be controlled within very close limits and can be varied from one hendred-thousandth of an inch per second to several thousandths of an inch per second. The load controlling mechanism is in the form of a horizontal surface which carries the deadweight load and moves downwards at a constant velocity. This arrangement ensures a uniform rate of penetration until such time as the test block refuses to accept the load at the pre-set constant velocity. At this moment the surface breaks contact with the load and the full load is transferred to the indenter which continues to penetrate the test block at a diminishing rate until either static equilibrium is achieved or the motion of the horizontal surface is reversed so as to pick up the load at the end of the specified duration period.

A number of experiments was made in which groups of ten indentations were made on a test block under identical conditions except that the uniform velocity of loading was changed for each group of indentations. Typical results obtained on two test blocks of hardness 950 HV and 500 HV are shown in Fig 3 and 4, where the

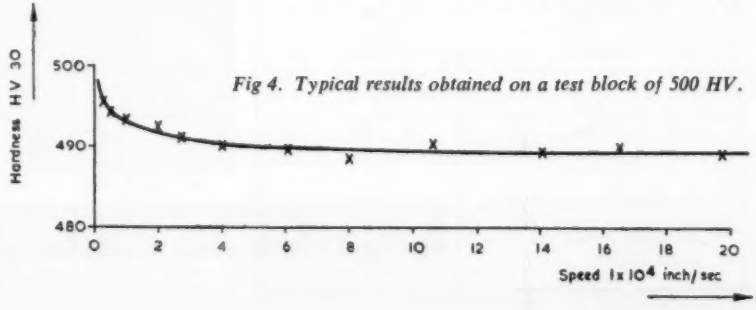


Fig 4. Typical results obtained on a test block of 500 HV.

mean hardness value obtained for each group of ten indentations is plotted against the velocity of penetration. It will be seen from these results that as the velocity of penetration is decreased the hardness value increases, and in particular the rate of increase is greatest as near-zero velocities are attained. This asymptotic approach of the curve to the vertical axis was found to be typical of all the velocity-hardness curves obtained, and shows that when slow rates of penetration are used the hardness values obtained will show large variations if the rate of penetration is not controlled within very close limits.

It was impracticable to obtain hardness values for velocities below 0.00001 in./sec due to the difficulty of measuring the velocity. However, an attempt was made to simulate the conditions that would obtain at extremely slow velocities by setting the rate of loading to 0.00005 in./sec and then stopping the descent of the load for a few seconds at the moment when the pneumatic indicator showed that contact between the load and the controlling mechanism was at the point of breaking. After the few seconds pause the controlling mechanism was lowered clear of the load and the full load maintained for 30 seconds. It is doubtful whether this technique would bring the load completely to rest as the surface on which the load rests is hydraulically controlled and creeps very slowly when not being driven. To ensure that the load had been truly brought to rest, the experiment was repeated with the exception that the movement of the controlling surface was momentarily reversed when the pneumatic indicator showed that contact was about to break, and the surface was then brought clear of the load. A number of indentations was made on a hard test block under these two conditions. The mean hardness values obtained, together with the mean hardness values for this test block at other velocities, are given in Table II.

TABLE II

Mean hardness value obtained at different velocities of loading

Velocity of loading (in./sec.)	Mean hardness value HV
0.00166	866
0.00060	874
0.00034	877
0.00012	881
0.00002	890
Controlling surface stopped	895
Controlling surface reversed momentarily	907

Although the velocities of loading for the last two values in Table II cannot be stated, the hardness values obtained confirm that the velocity hardness curve approaches the axis asymptotically and the Table demonstrates the large range of hardness values which can be obtained merely by changing the velocity of loading.

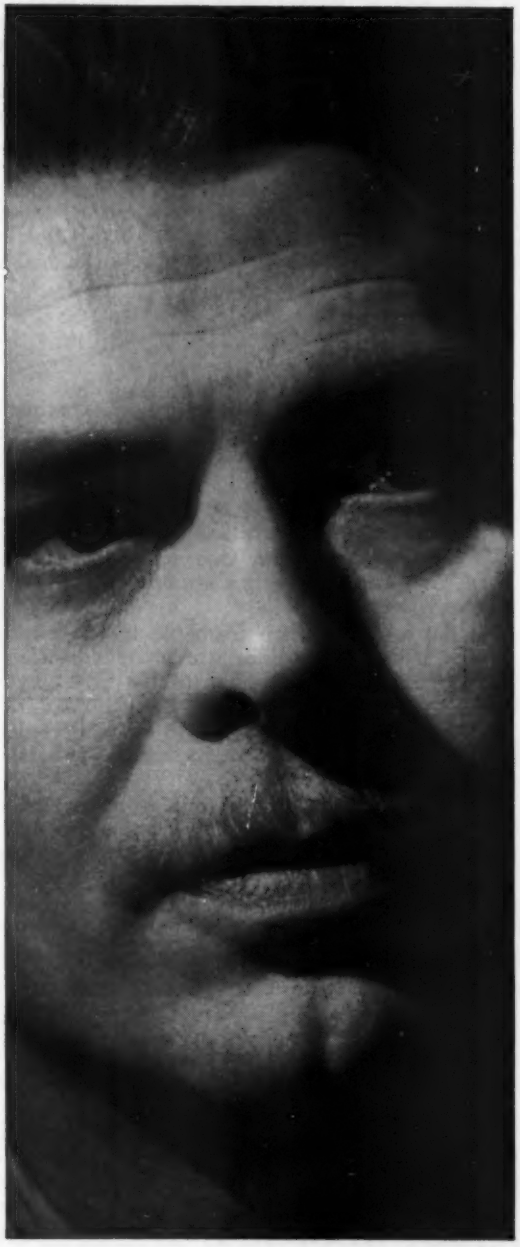
To determine which stage of the penetration is the most important, advantage was taken of the fact that the design of the indenting machine permits rapid changes of the velocity of loading to be made during the period of penetration. Experiments were carried out in which the velocity of penetration was changed from a high rate during the first part of the indentation to a low rate before the full load was transferred, and vice versa. It was found in each experiment that it was the final velocity which determined the size of the indentation and hence the hardness value obtained. This result applied whether the velocity was changed early or late in the period of penetration, and even applied in the experiments where the load was arrested at the moment of transfer, *ie* if the load were arrested at the moment of transfer, the hardness value obtained was independent of the initial rate of penetration.

Although this 'velocity of loading' effect is serious in the Diamond Pyramid Hardness test, it does not present insurmountable difficulties in the maintenance of common standards of hardness by standardizing authorities, nor does it seriously affect the verification of industrial machines. On the contrary, an awareness of this effect should make it possible to eliminate some of the performance differences which exist between industrial machines.

Because of the greater loads used in the Rockwell C test it was thought advisable to investigate this velocity of loading effect in the Rockwell test as it might be necessary to control the rates of penetration of the standard machine to be built within closer limits than had been envisaged. An experimental Rockwell machine was therefore made in which the 10 kgf minor load and 140 kgf major load could be independently controlled to vary the rate of penetration as each was applied.

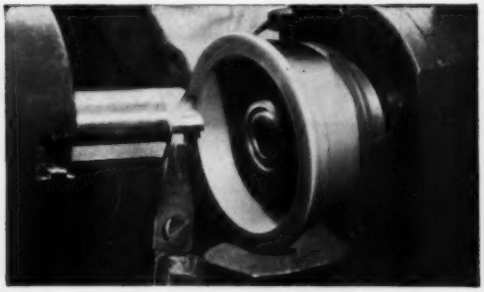
Continued on p. 192

CUSTOMERS OF CARBORUNDUM



"We get more jobs out of each wheel with these" says **Tom Swain**

Tom Swain is the charge-hand of the cutter-grinding shop of Jonas & Colver (Tools) Limited. Most of the tools they grind there go to the motor industry or the aircraft industry. Among the most successful production tools that Tom's men use are the resin-bonded diamond wheels made by CARBORUNDUM shown in our smaller illustration. 'We find we get more jobs out of each wheel with these.' Tom says, 'And that's important with diamond wheels. Diamonds cost money!' He might have added that long wheel-life saves time spent in wheel changing, and so increases the production rate — not a big increase, but worth something in the course of a year.



CARBORUNDUM can help YOU

Tom Swain knows what he's talking about — and in almost all the major industries of the world there are men who talk about us in the same way that Tom does: men who know that products by CARBORUNDUM are helping them to make better products, to cut costs, and to speed production. Trade barriers in Europe are falling, and competition will sharpen as they fall. High quality, low price, and early delivery dates will be the keys to the expanding European market. There will be rich prizes for those who can meet the challenge of the new Europe. Abrasive and refractory products by CARBORUNDUM can help *you* to win them.

Products by CARBORUNDUM TRADE MARK cut your costs

THE CARBORUNDUM COMPANY LIMITED, TRAFFORD PARK, MANCHESTER. *Tel: Trafford Park 2381*

The results of experiments with this machine showed that the hardness value obtained was affected by the rate of penetration for both minor and major loads, but that the effect was greater for changes in velocity of the major load. The effect of changing the rate of application of the major load on a test block of hardness in the neighbourhood of HRC 68 is shown in Fig 5. It will be seen that a change of hardness value of HRC 1 can be obtained for a change of velocity of 0.00015 in./sec, and it is evident from these results that the standard Rockwell machine must be designed to control the rate of penetration within close limits if variation in hardness value from this source is to be eliminated.

Indenters

Examination of diamond pyramid indenters from a number of suppliers has shown that indenters with flat pyramidal faces, included

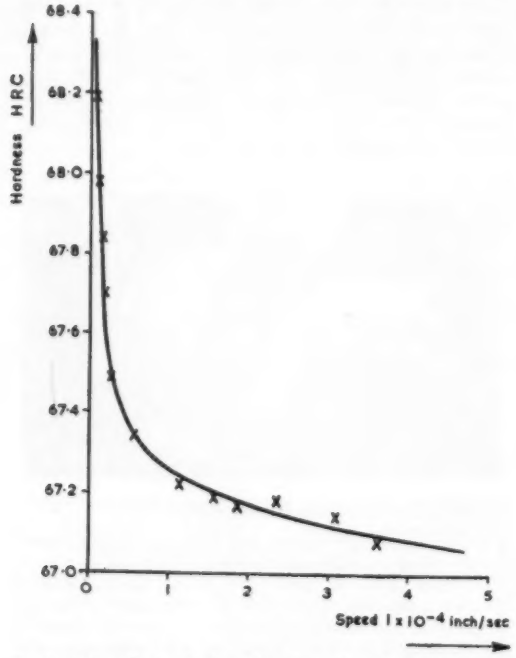


Fig 5. The effect of changing the rate of application of the major load on a test block of hardness in the neighbourhood of the HRC 68.

angles within ±5 minutes of arc of the nominal 136°, and points which are free from a ridge longer than 0.00002 in. are readily obtainable.

Performance tests with indenters of this quality on hard test blocks have shown that a variation of hardness value of 2 HV is the most that should be encountered. With imperfect indenters an error of 30 minutes of arc has been shown to introduce an error of 7 HV on a test block of hardness 940 HV, whilst indenters whose points have become slightly rounded have been shown to give values which are too large by about 5 HV.

The variation in hardness value in the Rockwell C test which can be introduced by the indenter is known to be large[1], and a thorough investigation of this source of error will be undertaken when the new standard Rockwell machine has been built.

Conclusions

It is evident from the results of the experiments discussed above, and from a general consideration of indentation hardness testing, that the hardness value obtained from a single indentation may be expressed as the sum of:

(*i*) the average hardness of the test block;

(*ii*) a contribution due to the local area indented having a structure which is not average;

(*iii*) a contribution from the indenter which may give values which are consistently higher or lower than that given by an average indenter;

(*iv*) a constant contribution from the indenting machine due to such factors as incorrect load;

(*v*) a variable contribution from the indenting machine due to friction, mis-alignment of the indenter, external vibration, etc;

(*vi*) a contribution dependent on the rate of loading;

(*vii*) a contribution dependent on the duration of the full load;

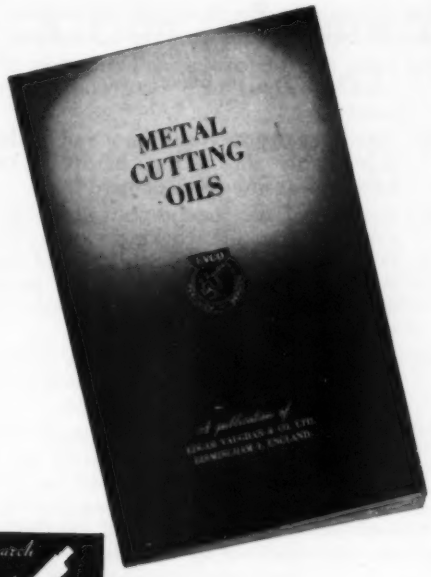
(*viii*) a contribution which may be random or systematic due to the measuring device and observer; and

(*ix*) a contribution due to sources of variability not listed above.

These contributions may be classified under three headings, and for any particular standard machine, which in the case of the Diamond Pyramid Hardness test comprises an indenting machine and a measuring microscope, they are as follows:

(*a*) constant effects arising from the design of the machine (*iii*, *iv*, *viii*);

Continued on p. 194



A copy for the asking . . .

In days when time is money and competition gets keener, the importance of cutting oils and lubricants is often overlooked. To help engineers and others concerned with the selection of the *right* cutting oil for a particular operation, we have produced the above booklet. If you have not received a copy, please—in your own interest—write for one to-day on your business heading.

The booklet is not a general treatise on cutting oils. It is, nevertheless, a helpful guide in the selection—with the advice of Edgar Vaughan & Co. Ltd.,—of the most suitable and economical oil or lubricant for a specific job of work.

In a general way, the booklet covers Neat Cutting Oils, Broaching Oils, Soluble Oils of all types, Grinding and Drawing Compounds.

Edgar Vaughan & Co. Ltd.

BIRMINGHAM · 4 · ENGLAND

Works and depots at: Birmingham Manchester Liverpool Southall (Midds.) Bristol Glasgow

Diamond Impregnated, Metal Bonded, Wheels and Laps

designed for life and speed

Indusmond's Diamond Impregnated tools have been designed to meet the demands of industry. Widely tested and now accepted as a standard throughout the country, these Wheels and Laps have been proved for longer life, faster cutting, and a minimum of loading during operation. Trained technical representatives in all parts are at your service and fuller information is available from either of our regional offices.

INDUSMOND (DIAMOND TOOLS) LTD

4, GREVILLE ST., LONDON E.C.1. ● *Phone* CHANCERY 7608/9
N. Office : SUSSEX ST., SHEFFIELD 4. ● *Phone* SHEFFIELD 20701

impregnated tools ● polished tools ● dressing tools ● a complete Diamond Tool Service

(*b*) effects which can be made constant by suitable control of the machine (*vi*, *vii*); and

(*c*) random effects (*ii*, *v*, *vii*, *ix*).

By attention to design and the choice of uniformly hard test blocks, a standardizing authority may reduce the contribution from (*a*) and (*c*) to a minimum, and can arbitrarily fix the contributions from (*b*) so that a scale of hardness can be maintained which is constant within close limits. However, it should be noted that this scale is not an absolute scale of hardness but is vested in the particular indenting machine and measuring microscope regarded as the standard.

The standard indenting machine built by the National Physical Laboratory has been designed so that the constant errors referred to above are not only small but are unlikely to change with time because the moving components of the machine, which are subject to wear, cannot influence the hardness values obtained. Similarly the performance of the measuring microscope is standardized by means of a line standard which can be kept constant regardless of time. However, the scale of hardness given by this machine can be arbitrarily shifted, by amounts which are commensurate with the tolerances used in industry, by changing the rate of loading and the duration of the full load.

To obtain consistent results from hardness tests carried out at the National Physical Laboratory it has been decided to fix these variables provisionally at 0.0003 in./sec for the final rate of loading, and 30 seconds for the duration of the full load.

Acknowledgements

The author desires to acknowledge the assistance of Mrs J. G. Wood of the Standards Division, NPL, and Mr Kozo Iizuka of The Central Inspection Institute of Weights and Measures, Tokyo, who carried out much of the experimental work described in this paper. The author also wishes to acknowledge the advice and assistance of Dr J. C. Evans who is responsible for the work of the engineering section of the Standards Division.

The work described above has been carried out as part of the research programme of the National Physical Laboratory, and this paper is published by permission of the Director of the Laboratory.

The choice of these particular values has been determined by the following considerations:—

(*i*) both rate of loading and duration of full load can be easily controlled at these values;

(*ii*) small departures from these values do not appreciably affect the hardness values obtained at any level of hardness;

(*iii*) the size of the indentations made by the standard machine working at these values is not far removed from the size of indentations produced by currently accepted industrial machines working with loads in the range 30 to 120 kgf; and

(*iv*) the time taken to standardize a test block when using the standard machine at these rates is economically acceptable.

The accuracy with which the hardness of test blocks as uniform as those produced by the NPL can be determined from the mean of ten indentations when using the standard machine under controlled conditions, is indicated by the close fit of the observed values to smooth curves in Fig 1 to 4. These results, together with repeated observations on test blocks over the past two years, indicate that the Laboratory is maintaining a constant diamond pyramid scale of hardness and that, in terms of this scale, the hardness of a test block which is free from large variations can be determined from the mean of ten indentations to an accuracy of $\pm 0.5\%$ of the mean hardness.

References

1 Performance tests on indenters for Rockwell hardness testing, by Marriner, R. S. *Engineer* 1955 Vol 199 p 56
Engineering 1955 Vol 180 p 17
Ind Diamond Rev 1956 Vol 16 p 48
Machinery (London) 1955 Vol 87 p 32
Sheet Metal Industries 1955 Vol 32 p 610

2 Hardness testing (Rockwell principle) B.S. 891 : 1940

3 A new standard hardness testing machine, by Marriner, R. S., and Mason, F.C.P.
Engineering 1958 Vol 185 p 339
Machinery (London) 1957 Vol 91 p 1225
Machine Shop Mag 1958 Vol 19 p 31
Metallurgia 1958 Vol 57 p 47

4 Test blocks for indentation hardness testing, by Wood, J. C. (Mrs) *Ind Diamond Rev* 1959 Vol 19 p 166

New Discoveries in Yakutia

A diamond placer has been discovered by Leningrad geologists in the far northwest of the Yakutian Autonomous Republic, in Eastern Siberia. It has been traced along a 43 mile stretch.

The geologists have also discovered 3 kimberlite pipes indicating real prospects for a further search for rich diamond deposits.

Prospecting is to be continued in 1960.

Israeli Trade Statistics

Israel's exports for August 1959 totalled $11,4000,000, of which amount diamond exports accounted for $3½ million. This compares to $7,600,000 in August 1958, when diamond exports totalled $2,900,000.

Between January and August 1959, Israel's exports amounted to $124,600,000, as against $103,100,000 for the corresponding period of 1958. Diamond exports accounted for $29,700,000 of the 1959 total, compared to $22,400,000 for the 1958 figure.

Grinding the Chiswick fly-over

Over 13,000 reinforced high-tensile steel rods have gone into the four spans of the huge Chiswick fly-over. The cutting-off of this enormous number of steel rods, after setting in concrete beams, was successfully accomplished by use of a Wolf high-speed, heavy-duty angle grinder, type AG7, after established cutting methods had been considered time wasting and inefficient.

In the four spans of this fly-over, 1,104 cables each containing 12 lengths of rods are involved—a total number of 13,248; the AG7 cut through each cable of 12 lengths in only two minutes.

A Film for Recording the Reactions in the Diamond Wheel Structure*

by **K. E. Schwartz****

Summary

An apparatus was developed and put into practical use with which it was possible to record continuously the processes at a particular point in the grinding layer of a grinding wheel. The equipment consisted of only a sub-standard film camera, a stroboscopic light, suitable synchronization set-up, and optical compensation. It was possible to record accurately the occurrence of wear in the grinding wheel with regard to its progress relating the amount of wear to time, and to draw conclusions concerning the chip process in grinding.

The equipment is applied extensively to the field of chip research in grinding, so that knowledge of the processes can be extended.

In research into the chip formation during grinding, there have been many attempts to make the processes clearly visible, in addition to evaluating phenomena affecting the grinding wheel structure, on the basis of the grinding performance, the cutting power, and the measurable wear. At first, we were satisfied with observation through microscopes. Later, stereoscopic cameras[1,2] were developed which widened the possible scope of knowledge considerably. These experiments were limited to determining the condition of the wheel structure at prescribed intervals. It is not, with these methods, possible to be positive as to how a particular process has developed or exactly when a certain change took place. These questions can only be answered if the grinding wheel structure can be watched at very short intervals, and, in extreme cases, after each revolution of the grinding wheel.

One possible method is to photograph the grinding wheel surface during the grinding at certain intervals. During a series of experiments covering a wide field, for which the *Deutsche Forschungsgemeinschaft* supplied the equipment, a special film apparatus was developed for this purpose.

With the equipment described in the following article, by means of a 16 mm sub-standard film camera, which had specially developed attachments to suit the special application, it was possible to formulate data on the phenomena occurring within the structure of the wheel in the section under observation, relating the amount of wear to the grinding time.

Photographic equipment

The equipment will be thoroughly described in this article. There were many difficulties to be overcome before the equipment could produce satisfactory results, which meant that it went through many stages of development. The precise nature of the problem was only appreciated for the first time during this period, and it finally resolved itself to the following three points:

1. Very short exposures must be possible, or optical aids used, in order to record the high peripheral speeds of the grinding wheel;

2. Accurate and reliable synchronization of the film timing with the turning grinding wheel was necessary for it to be possible to take the same section of the wheel each time:

3. It must be possible to use an elapsed-time device.

In order to be able to calculate the time of exposure, the conditions for taking the photographs must be briefly set out; it is known that a quickly moving object can only be photographed with any degree of sharpness if a short enough exposure time is used. The speed of revolution of grinding wheels is normally between 25 and 35m/sec. A motion blur on the film of 0.1 mm can be allowed without the picture's quality being noticeably spoilt. If an enlargement of the object to be taken of 10 is required the movement of the grinding wheel must only be 0.01 mm in the time of exposure. The

* Reprinted by permission of *Industrie Anzeiger* 1958 Vol 80 (92) pp 1391-1395 (Nov 18)

** Laboratorium fuer Werkzeugmaschinen und Betriebslehre der Technischen Hochschule, Aachen.

exposure time then comes to

$$t = \frac{s}{v} = \frac{0.01}{30 \times 10^3} = 3.3 \times 10^{-7} \text{ sec.}$$

The smallest flash times possible with the light values necessary for such photographs by means of spark discharge, are from 1 to 3×10^{-6} sec, thus lying a power higher than those desired. With this exposure time under the conditions specified a motion blur of about 1 mm would show on the film, so that it would no longer be of any value.

In order to overcome this, two courses are possible: first of all, peripheral speeds of about 8 to 10 m/sec were used, for which the exposure time was just enough. A great number of effects could then be made apparent, although the conditions most favourable for the grinding process did not exist. The second way was to use an optical compensation technique. This demands a considerable expenditure in construction, but does make it possible to use higher speeds and exposure times. Both methods were used for the experiment; they are both extensively described elsewhere.

The synchronization will be accurate only if the moving object, in this case the grinding wheel, is photographed at a specific, chosen position, and if the succession of pictures can be projected as a continuous film. Each time the flash moment is retarded or advanced, the result is a break in the projected picture, which renders accurate observation impossible.

The synchronization is in two parts. First of all, the camera must be connected to the grinding spindle by a drive adjusted to the camera gearing. This ensures that at the moment of the flash which works the exposure, the shutter of the camera is opened. The second operation is considerably more difficult, being that of lighting up the flash bulb in agreement with the specific angular position of the spindle, with great accuracy. The first operation is performed mechanically by means of a flexible shaft, the grinding spindle and camera apparatus being connected in the appropriate manner. In synchronization of the flash bulb attempts were made to use a mechanical contact breaker, which was attached to the grinding spindle. This was very liable to go wrong, however, and only the development of an optical-electrical contact gave satisfaction.

A time-lapse device was necessary for the following reasons:

According to the demands made on a grinding wheel, the changes in structure due to particle wear or dislodgement are very varied. In long use of the wheel, the visible changes in the time unit are less marked than in a short period of use. In the first case, it is therefore not advisable to take a photograph after each revolution of the wheel, in fact it is far more desirable to get a better view of the processes by means of a time-lapse effect. This can be achieved with a change gear device in front of the camera drive, and care must be taken here to see that the synchronization control for the flash bulb can be co-ordinated with it. In accordance with the ratios in use, the length of the time interval between photographs must be regulated.

Development of the apparatus

The experimental requirements were so difficult to satisfy that it was only with time that satisfactory developments were made. In the following paragraphs two stages of development will be described; the arrangement with the high speed flash lamp, which could be used with grinding wheel speeds of 10 m/sec, and also the calculation and construction of an optical compensation which enabled higher exposure times and higher speeds to be used.

The system for the arrangement of the flash lamp and the optical-electrical synchronization is shown in Fig 1. Camera, flash bulb, grinding wheel, and workpiece are recognisable. The camera drive is connected to the grinding wheel spindle by means of a flexible shaft and a gear. This is in the form of a multi-stage gear box with a stage ratio of $\Phi = 5$, so that the ratios 1:1, 1:5, 1:125, and 1:625 between frames and grinding wheel spindle revolutions can be used. On the drive side of the grinding spindle, fixed rigid with the grinding wheel, there is a revolving mirror, which reflects the image of a unilinear filament lamp, specially made for the purpose, from a second, fixed, mirror, at one specific position of the spindle, on to a photocell. The photocell emits an electrical impulse which is amplified and gives the signal to trigger the flash. First of all, the switch impulse passes over a blocking contact, however, which can open or close the circuit in accordance with the selected camera drive ratio. In the switch circuit are included the unilinear filament lamp with current supply, the photocell with a dispersion lens cut in circuit and a wide-band amplifier for 1 to 3500 Kc/s. The camera is mounted on heavy plates which are fixed rigidly to the machine, so as to exclude disturbing vibrations in the photographic system. The change gears are on one of the plates with the blocking contact, and the connector for the flexible shaft. The camera is equipped with a detachable, adjustable tube which gives linear enlargements of from x-2½ to x-10

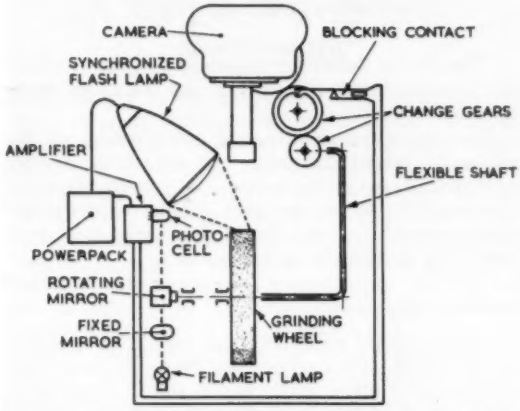


Fig 1. Experimental Setup showing the grinding wheel camera, driving mechanism, flash lamp and its associated control device. The optical compensation equipment is not shown here.

when objectives of different powers (Zeiss-Mikrotare) are used. A Super-Stroboscope was used as flash lamp for the photographs. By means of a very short distance between the condenser and the spark gap this lamp made the necessary exposure times of 1.10^{-6} sec possible with a light density of 20.10^{6} stilb. The light source was directed at 45° to the surface to be photographed.

As this set-up allowed only low speeds of rotation for the grinding wheel, it was necessary to develop a photographic apparatus with optical compensation, so as to obtain data concerning the phenomena in normal working conditions. For this purpose the movement of the grinding wheel was compensated for by means of a moving optical system such as is used in high-speed motion cameras to compensate for the movement of the film. In the apparatus described the compensation was effected by means of a revolving mirror. It was necessary that the mirror should turn in such a way that the movement of one point on the grinding wheel remained in the image plane during the exposure time as a fixed point.

Fig 2 shows the light path. The movement of the grinding wheel during the exposure time, is indicated by 'u', with radius R; φ is the corresponding angle of rotation. The width of the object is found by means of the lens formula:

$$\frac{1}{f} = \frac{1}{a} + \frac{1}{b} \qquad (1)$$

and the chosen degree of magnification

$$V = \frac{b}{a} \qquad (2)$$

From this the angle α can be calculated as

$$\alpha = \frac{R}{a} \qquad (3)$$

If the mirror is now turned at a chosen point in the light path through the angle φ, the ray thus corrected will fall parallel to the first. In order to obtain complete compensation it is necessary that the light should be turned further through an angle $\beta 2$. The size of the angle β depends on the distance between the revolving mirror and the image plane, and must, besides, satisfy the requirement

$$\frac{\alpha + \beta}{2} \cdot \frac{l}{\varphi} = K. \qquad (4)$$

in which K must be a constant value, so that the mirror always reflects the same spot on the wheel. In the present case, $L = 2$ was chosen. The spacing of the width of the image at the point C through the mirror can be geometrically expressed. If a change of 'd' in the time of exposure is taken, the result obtained with the values chosen in the figure will be:

$$d = \frac{BC \cdot \sin\alpha}{\sin\gamma} = \frac{CD \cdot \sin\beta}{\sin\xi} \qquad (5)$$

Furthermore

$\xi = 180 - \gamma$ and $\sin\xi = \sin(180 - \gamma) = \sin\gamma$,

so that it follows that

$$\frac{BC}{CD} = \frac{\sin\beta}{\sin\alpha} \qquad (6)$$

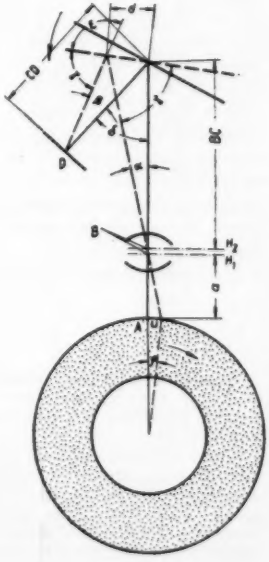


Fig 2. Light path in equipment diagrammatically shown. D is the fixed mirror, C the revolving mirror and B the camera lens system. The angles marked are referred to in the text.

For very small angle variations, which appear here, the equation simplifies itself to

$$\frac{BC}{CD} = \frac{\beta}{\alpha} \quad . \qquad (6a)$$

Applying equations 3 and 4, we may say:

$$\frac{\alpha+\beta}{2 \cdot \varphi} = \left(\frac{R}{a} \cdot \varphi + \frac{BC}{CD} \cdot \frac{R}{a} \varphi \cdot\right) \frac{1}{2 \cdot \varphi} = K = 2 \quad (7)$$

and from this

$$\frac{R}{a}\left(1 + \frac{BC}{CD}\right) = 4 \qquad (7a)$$

$$\frac{BC}{CD} = \frac{4 \cdot a}{R} - 1. \qquad (7b)$$

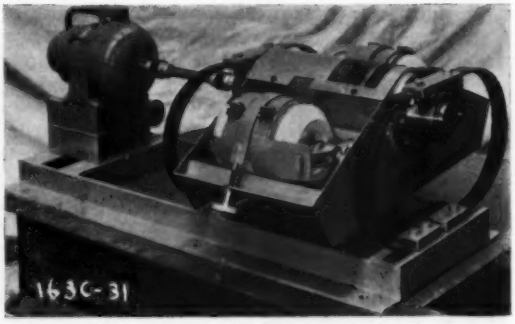
This is the definitive equation for the position of the revolving mirror, of the ratio of angle speeds is $K = 2$.

For the compensation to correspond to the changing wheel diameter, an adjustable mirror was placed in the light path CD, so enabling the distance CD to be changed. This mirror could also be swivelled and inclined, so that the image could be accurately centred.

To be continued

Vibratory Ball Mills

As powder metallurgy demands high degrees of uniformity in the powders which will be compacted, it is obvious that any improved method of preparing these powders will offer a considerable advantage to the manufacturer who makes use of it. The increasing use at present being made of vibratory ball mills indicates that the industry is probably finding them more efficient that the rotary mills used until now. The materials used in the vibratory mills offer no manufacturing difficulty as they are in most cases identical to the materials used in the manufacture of the older type of mill, and their advantage lies not in any revolutionary material but in a new use of existing materials. A typical vibratory mill is shown in the accompanying illustration. The pots, in this case two, are gripped in a spring mounted frame which is vibrated through an eccentric driven by the electric motor at the left. The vibration is rapid and causes a cascading action inside the pots which contain the grinding balls and the material to be ground. Very hard materials, *eg* tungsten carbide, can be reduced to a particle size of 1 micron and less, thereby providing an extremely fine powder for compacting. There is a wide range of capacities available in the mill, from the small laboratory size mills to those for large scale production. The pots used must have a high resistivity to abrasion and this is achieved by using either hard white porcelain or stainless steel. Both types of pot are designed to obviate corners and other spots which might retain large size particles, thereby reducing the uniformity of the powder produced. The standard charge of grinding balls for the porcelain pots is approximately equal weights of three-quarter inch and one inch diameter porcelain balls. The stainless steel pots use a two to one ratio of three quarter inch and one inch diameter 12% chromium steel balls. Despite the hardness of these balls the wear on the pots is so slight that it may be discounted. In addition to the mills using pots there are also larger mills which use a different type of container. Information on the complete range of vibratory ball mills is available from Apex Construction Ltd, 15, Soho Square, London W 1.



Venezuelan Diamond Industry

According to a recent report by the Venezuelan Ministry of Mines and Hydrocarbons, Venezuela's diamond production totalled a yearly average of 87,559 carats over the last 10 years.

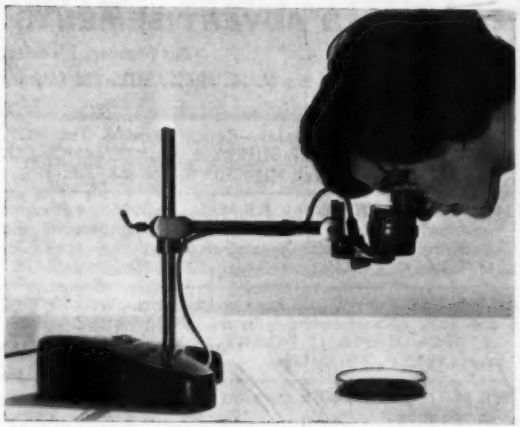
An exceptionally high amount of diamonds was produced in 1957, when the total reached 122,598 cts. Production dropped to 89,565 cts in 1958 following a very long rainy season in Bolivar State and in the Amazones Federal Territory, where the diamonds are washed from the river sands.

Exports accounted for 88% of the country's production over the past 10 years. A record 115,188 cts were exported in 1955. Last year, exports totalled 72,889 cts valued at 4,309,056 bolivares ($1,280,000). The USA was best customer, buying 44.8% of this figure, followed by Bermuda (31.2%), Belgium (17.6%), and Germany (5.2%). Other buyers were Britain, Japan and Italy.

During the period 1949-58, Venezuela produced 907,475 metric carats, divided as follows: 527,265 m.cts. industrials, 258,361 m.cts for gems, and 121,849 m.cts boart type.

A Simple Stereoscopic Microscope

Magnified examination of large numbers of small objects, or detailed investigation of large areas can be a troublesome and fatiguing operation. A great deal of the difficulty can be removed from this, as from most actions, by the proper use of the proper tools, and one of the most satisfactory tools for this purpose is the 'Sterimag', which might be described as a production line stereoscopic microscope. Its virtues are its simplicity, its sturdiness, and its convenience in use. It gives two scales of magnification, (x 10 and x 20) with completely separate optical systems for each eyepiece. A very complete range of adjustments for the most comfortable working position is given by the design of the stand, which in addition allows the whole microscope head to be swung aside out of the way if desired. The heavy base contains the transformer that supplies the built-in spot light, which provides good illumination for the whole of the wide field of view provided by the optical system. The 'Sterimag' can be obtained from Wire Products and Machine Design, Kingsbury Works, Bridge Road, Haywards Heath, Sussex, from whom further details can be obtained.



The 'Sterimag' being used for the examination of a powder sample.

New Factory for J. K. Smit & Son

Foundation stone of J. K. Smit & Son's new factory at Colwyn Bay was laid by Mr. Johan J. Smit, Snr. on September 30. The new premises will be occupied in the early summer of 1960 and have a production area of 19,000 square feet, about four times the area of their present factory. The company has been in Colwyn Bay since 1947 and at present has over 100 employees.

Concluded from p. 185

as we are always glad to have the opportunity of increasing knowledge of industrial diamonds.

Solid Fact

These symptoms are comparatively tenuous and unsubstantial, however, when compared with the more readily assessable facts such as sales figures. We are informed that the sales figures for the first three quarters of 1959 for industrial diamonds showed an increase of 86% over the figures for the corresponding period of 1958. Industrial diamond sales from African sources amounted to over £20,000,000 in the first nine months of this year, as compared with approximately £11,000,000 in the same part of 1958. At the same time, the sales of gem diamonds also showed a substantial increase.

ADAMANT.

THE HENDERSON DIAMOND TOOL COMPANY LTD.,

43-45 ALLESLEY OLD ROAD, COVENTRY

Telephone : Coventry 75617

MANUFACTURERS OF DIAMOND TOOLS.

ALL TYPES OF ABRASIVE DIAMOND TOOLS

RESET AND RETURNED WITHIN **48 HOURS**

OF RECEIPT AT THE ABOVE OFFICE.

TOOLS FOR SPECIALISTS MADE TO CUSTOMERS OWN REQUIREMENTS

CLASSIFIED ADVERTISEMENTS

2d. a word, *minimum* 4/-. *Box Numbers* 1/- *extra.*

Address Box No. replies to : N.A.G. PRESS, LTD., 226 Latymer Court, London, W.6.

TIME RECORDERS.—Sales—Rental Service. Tel. HOP. 2239. TIME RECORDER SUPPLY & MAINTENANCE CO. LTD., 157/159 Borough High Street, London, S.E. 1.

MR. M. DAVIDSON, F.S.M.C., qualified opthalmic optician, is in constant attendance, for sight-testing and dispensing of optical prescriptions, at the HATTON OPTICAL CO., 19 Hatton Garden, E.C.1. (Tel. HOL 8193).

DIAMOND POWDERS mesh and microns, purity 98/99% available. Also diamond splinters. Inquiries: **AFRIKA DIAMANT BOART, 24 VESTINGSTRAAT, ANTWERP, BELGIUM.**

WE MANUFACTURE diamond tools, wheels and lapping compounds.
NATIONAL DIAMOND LABORATORY, Peekskill, N.Y., U.S.A.

SWISS MADE MACHINES for jewel bearing production for sale. Adaptable for machining quartz, carbide, ceramics, germanium, sapphire. **JAMES MELLING, LIMITED,** 113 Bedford Road, **ROCK FERRY.** Rock Ferry 711.

MIDWESTERN United States Diamond Wheel Manufacturer seeks experienced technician in field of metal-bonded diamond wheels, diamond saws, hand laps, etc. Excellent opportunity for advancement. RAYBESTOS-MANHATTAN, INC., Wabash Division, Crawfordsville, Indiana, U.S.A.

DIAMOND TOOLS, by Paul Grodzinski, 380 pages, 200 illustrations, charts etc. Cloth bound 20s, by post 21s 6d, from N.A.G. PRESS, LTD., 226 Latymer Court, London, W.6.

THE DIAMOND NEWS

and

SOUTH AFRICAN JEWELLER

(Official organ of S.A. Jewellers Association, Ltd.)

The Voice of the Diamond Industry

- The only magazine of its kind on the African Continent ; circulates throughout the World, including Russia.
- Many of our supporters are your front-line ambassadors on whose goodwill and co-operation much depend ; reach these potential buyers and sellers through this medium.
- A monthly magazine containing approximately 72 pages of text matter, suitably illustrated.

Subscription Rates, per annum 21/- (Post free)

For information on Rates and spaces available, write :—

Advertising Manager,
P.O. Box 361,
KIMBERLEY,
South Africa.

ADVERTISERS' INDEX

	Page
Carborundum Co. Ltd.	191
Diamant Boart	183
Diamond News, The	200
Drukker, D. & Zn. N.V.	184
Habit Diamond Tooling Ltd.	Cover III
Henderson Diamond Tool Company, Ltd., The	199
Impregnated Diamond Products Ltd. ...	Cover IV
Indusmond (Diamond Tools) Ltd	193
Industrial Diamond Co. (Sales) Ltd. ...	Cover II
Smit, J. K. & Sons (Diamond Tools) Ltd.	181
Triefus & Co. Ltd.	Cover I
Vaughan, Edgar & Co., Ltd.	193
Wolverhampton Diamond Die & Tool Co. Ltd.	183

o

● PUBLISHERS : N.A.G. PRESS, LIMITED
226 Latymer Court, Hammersmith, London W.6, England Telephone : RIVerside 2143

o

Contributions of scientific, technical and practical interests and news items are invited, but responsibility cannot be accepted for the safety of MSS, drawings, photographs or other matter submitted. Unaccepted matter will be returned.

o

Information of Rates and spaces available for Trade Advertisements will be forwarded on request. I.D.R. is published monthly on the 18th at 1/3 a copy. It is obtainable through Newsagents and Booksellers, or by Postal Subscription, 15s. a year post free, from the Publishers' address above.

Subscriptions in U.S.A $2.50 are received by the usual U.S.A. Subscription Agencies or direct from the Publishers, address as above.

INDUSTRIAL DIAMOND ABSTRACTS

Industrial Diamond Information Bureau,
2 Charterhouse Street, London, EC 1.
Telephone : FLEet Street 1577

1959 Volume 16
OCTOBER

DIAMOND MINING AND INDUSTRY

Alluvial diamond returns for April 1959

Anon. *Diamond News* etc 1959 Vol 22 (10) pp 33-34 (July)

Rough and uncut diamond production in April 1959 for Cape Province : 5,862.25 ct of total value £45,841 (156s 5d per ct) ; Private Estates : 248.75 ct of total value £5,668 (570s 4d per ct) ; Transvaal Province : 9,960.50 ct of total value £34,558 (69s 5d per ct). Thus total production amounted to : 16,071.50 ct of total value £86,067 (107s 1d per ct).

M *Ebe F.13.361*

Tanganyika diamond exports

Anon. *Diamond News* etc 1959 Vol 22 (10) p 30 (July)

Exports for May 1959 : 27,939 ct of total value £218,700 (156s 6d per ct). Total exports for January to May 1959 : 120,332 ct of total value £925,220 (153s 9d per ct). Corresponding exports for May 1958 : 35,927 ct of total value £280,444 (155s 7d per ct). Total exports for January to May 1958 : 171,883 ct of total Value £1,580,547 (183s 10d per ct).

M *F.13.364*

Order introduced on West African diamond fields

Anon. *Diamond News* etc 1959 Vol 22 (10) p 5 (July)

The recently concluded agreement between the Sierra Leone Government and the De Beers Corporation will probably play an important part in reducing the illicit diamond digging and trading in West Africa. The illicit diamond business has flourished there partly because all but about 10% of the stones found are of gem quality. It has proved almost impossible to oust the African diggers who swarmed the area before 1930, and who have left shallow pits all over the region. At present the production of these diggers in the free area allotted to them is estimated to be about 40% of the possible deposit, compared with 98% in the area allotted to the Selection Trust, where modern machinery and methods enable the most efficient and profitable working to be carried out. *A* *F.251.2598.36*

Mining miscellany

Anon. *Min Journ* 1959 Vol 253 (6468) p 125 (Aug 7)

Detailed prospecting of India's Panna diamond mines is to be started. *W* *F Hd.12.371*

Diamond mining in Africa

A. R. Harrison. *Sheffield Univ Min Mag* 1958 pp 87-94

Paper to the Sheffield Univ Min Soc, read by M. P. O'Connor.

The subject is treated under the following headings : occurrences, underground mining methods, alluvial deposits, mining of West African and Central African deposits, and treatment of deposits. A map shows the various African deposits, and indicates whether they are alluvial (inland), pipes (opencast), alluvial (marine), or pipes (worked underground). A flow sheet shows a modern treatment and recovery plant. 3 illustr, 4 ref.

W *Ebc Hd.36/Ebe Hd.36*

Synthetic diamonds in perspective

Anon. *Min Journ* 1959 Vol 252 (6443) pp 167-168 (Feb 13)

A survey of the position of synthetic diamonds in relation to the boart market. It is concluded that there is room for both natural and synthetic products as world needs are rising. *W* *Fc N*Fh N*

Pequannock diamond center for industrial use in USA

S. B. Bace. *The Herald News* 1959 pp 13-14 (July 20)

Interview with Mrs M. J. McGinnis, Executive Manager of Ind Diamond Assoc of America, Inc. Some industrial uses of diamond are mentioned, and examples are given of typical enquiries received by the IDA. 1 illustr. *W* *F.222.342*

Mining miscellany

Anon. *Min Journ* 1959 Vol 252 (6440) p 98 (Jan 23)

Yakutsk diamond mining is to be expanded during the next seven years in order to meet the needs of all Communist countries. *W* *F Hd.332*

Illicit diamond mining in Sierra Leone

Anon. *Min Journ* 1959 Vol 252 (6441) pp 113-114 (Jan 30)

A survey of illicit diamond mining activities.

W *F Hd.3672:.2598*

Guinea's mineral wealth

M. Moyar. *Min Journ* 1959 Vol 252 (6446) pp 254-255 (Mar 6)

Details are given of the mining industry covering history, production, and recovery methods. (To be cont). 2 illustr. *W* *Bc Cb.3662*

CONTENTS

Diamond Mining and Industry	A177	Rock Drilling	A185
Physical, Chemical, and Mechanical Properties	A178	Wire Drawing	A187
Diamond, etc, in Instruments	A179	Grinding and Polishing of Hard Metals ...	A187
Hardness and Wear Testing	A179	New Machining Methods	A204
Truing of Grinding Wheels	A180	Powder Technology	A205
Fine Boring and Fine Turning of Metals ...	A182	Tool Production	A205
Cutting and Machining of Glass	A184	Surface Finish Testing	A205
Machining of Stone, etc	A185	Miscellaneous	A206
Gem Polishing	A185	Publications Received	A206
		Patent Lists	A208

Marketing of Sierra Leone diamonds

Anon. *Min Journ* 1959 Vol 252 (6462) p 702 (June 26)

Details of the new agreement on the marketing of Sierra Leone diamonds.

W *F.3672:.251*

Mining miscellany

Anon. *Min Journ* 1958 Vol 251 (6436) p 725 (Dec 26)

Several minerals, including diamond, have been discovered in the Kalimantan area of Indonesia.

W *Bc.13.3751|F.13.3751*

Industrial diamond sales continue to gain

Anon. *Carbide Engg* 1959 Vol 11 (8) p 36 (Aug)

Increased demand by industry raised the total sales of industrial diamonds, in the second half of 1959, to 113% of the 1958 figure for the same period.

D *F.251*

Another diamond area ?

Anon. *Goldsmiths Journ* 1959 Vol 65 (487) p 401 (Sep)

De Beers have negotiated an agreement with Mr Jack Scott, of Johannesburg, who obtained from the Paramount Chief the exclusive right to prospect in Basutoland three years ago. There are indications that a rich diamond pipe exists in the territory, but no traces have yet been found of the diamonds.

A *Ebc.361*

Diamonds from Angola. Diamanten aus Angola

Anon. *Dtsch Goldschmiede Ztg* 1959 Vol 57 (8) pp 436-437 (Aug) (In German)

Diamonds were found in 1913 in Angola, and the Angola Diamond Co, Diamang, was founded soon afterwards by an agreement with the Government allowing the company the rights over a million square kilometers of land, up till 1971. The blue ground stretches right into the Belgian Congo, where the Forminière Co has the mining rights. Stones are comparatively pure, suitable mostly for gem use. The stones come to London for sorting, qualifying, and cutting, but the Portuguese Diamond Cutting Co has been founded to start a cutting industry in Lisbon.

A *F Hd.3676|F.25.3676*

Sifted 600 diamonds

A. Slocum, Murfreesboro, Arkansas. *Diamond News* etc 1959 Vol 22 (10) p 15 (July)

After about a year's sifting at a makeshift washing plant in Arkansas, some 600 diamonds are claimed to have been combed out, of which about a third is cuttable.

A *F He.342*

Tanganyika's mining industry in 1958

Anon. *Min Journ* 1959 Vol 252 (6446) pp 257-258 (Mar 6)

Diamond production figures are given: exports of rough were a record at 515,762 carats.

W *F.13.364*

Minerals outlook in the Belgian Congo

Anon. *Min Journ* 1959 Vol 252 (6440) pp 95-96 (Jan 23)

Details of diamond production are given.

W *F.13.365*

LITERATURE REQUESTS

When applying for the loan of literature abstracted in this journal, please quote the title of the article, the name of the author, and the number of the page on which it appeared.

PHYSICAL, CHEMICAL, & MECHANICAL PROPERTIES OF DIAMOND AND OTHER HARD MATERIALS

Infrared studies on polymorphs of silicon dioxide and germanium dioxide

E. R. Lippincott, A. Van Valkenburg, C. E. Weir, E. N. Bunting. *Journ Res NBS* 1958 Vol 61 (1) pp 61-70 (July)

The infrared spectra of coesite, low-temperature tridymite, low-temperature cristobalite, low-temperature quartz, vitreous silica, hexagonal GeO_2, tetragonal GeO_2, and vitreous germania are reported from 4,000 to 300 cm^{-1}. Wherever possible an assignment of frequencies has been made on the basis of the selection rules for the crystal symmetry. Three characteristic group frequencies near 1,100,800, and 480 cm^{-1} are common to all the polymorphs of SiO_2. These frequencies respectively correspond to a stretching mode involving displacements associated primarily with the silicon atoms, and a Si-O bending mode. The presence of these group frequencies in coesite indicates that the co-ordination of silicon in coesite is tetrahedral, and that its high density is associated with the packing of tetrahedral units at an angle approximating 120°. The tetragonal and hexagonal GeO_2 polymorphs show a marked difference in spectra due in part to the change from six-fold to four-fold co-ordination. The assignment of observed frequencies in hexagonal GeO_2 is consistent with that made for low-temperature quartz if allowance is made for the heavier mass of the Ge atom. 15 illustr, 9 ref, 9 tables.

X *Rlz Ukj.21|Rmz Ukj.21*

Diamond 2.7 times harder than sapphire

H. Meincke. *Gemmologist* 1959 Vol 28 (336) p 122 (July)

A diamond with a surface oriented in the cube direction (100) was scratched with a diamond cone oriented according to (111) and with an included angle of 120°. Observable scratches were eventually obtained of 7.5 micron under a 200 g. load. This gave an indentation hardness of 7,850 kg/sq mm. With sapphire under a 100 g load, indentation hardnesses of 3,450 kg/sq mm on the (0001) face and 2,500 on the (1010) face were obtained. Single crystal behaviour in metals leads to the conclusion that there is a maximum hardness perpendicular to a crystal axis and a minimum hardness parallel to it. The figure quoted for diamond is therefore only an overall value. Three different methods have been used to indicate the hardness value of diamond, which is about 8,000 kg/sq mm.

W *Bbd Unh*F Unh*

New method reduces beryllium's brittleness

Baltimore Div, Martin Cox, Baltimore. *Steel* 1959 Vol 145 (1) p 88 (July 6)

Brittleness in beryllium is caused by the planes of weakness in the metallic crystal which make the material as brittle as glass. A new method of controlling the crystal size and orientation during sheet fabrication has been discovered, so that the brittleness will be reduced and the uses of beryllium extended.

A *Bfu Unlz*

Cultured rubies that are strain-free

Cultured Gem Stones, 580 Fifth Ave, New York, NY. *Product Engg* 1959 Vol 30 (35) p 17 (Aug 31)

Samples of the first cultured rubies will soon be available for engineering evaluation. Grown by a secret process, they are claimed to have properties different from those now available. Cultured emeralds, already familiar on the jewellery market, are also being explored for possible industrial applications.

D *Bbeb Unq|Bbjbb Unq*

Infrared studies in the 1- to 15-micron region to 30,000 atmospheres

C. E. Weir, E. R. Lippincott, A. Van Valkenburg, E. N. Bunting. *Journ Res NBS* 1959 Vol 63A (1) pp 55-62 (July/Aug)

A pressure cell was constructed using a pair of type II diamonds for study of infrared spectra of solids in the 1 to 15 micron region. Using commercial infrared equipment, spectra can be studied routinely to calculated pressures as high as 30,000 atmospheres. Under pressure, bands generally shift to higher frequencies and decrease in intensity. The magnitude of both changes depends on the mode of vibration. Occasionally major changes in spectra occur. In calcite the carbon-oxygen symmetric stretching, mode ν_1, becomes active at elevated pressures, while the doubly degenerate ν_2, stretching, and ν_4, bending, frequencies split. From the shift in frequency of ν_1 with pressure the compressibility $[(-1/Ro)\ (dR/dp)]$, of the C-O bond length, R, is calculated to be 2.8×10^{-7} atmosphere. Major spectral changes are not observed in the same pressure ranges in other carbonates having the calcite or aragonite structures. The results for calcite may be explained by a shift of the $CO_3^=$ ion from the trigonal axis under pressure. 10 illustr, 21 ref.

X *Bz Ukj.21:F*

Time dependence of autoelectron current from tungsten point

L. Eckertová, K. Masek. *Czech Journ Phys* 1959 Vol 9 (4) pp 512-516 (In Czech, abstr in English)

A description is given of the increase in autoelectron current from a tungsten point with time after the voltage on the electron projector has been switched off. It is assumed that the increase in current is caused by desorption of the adsorbed layers, which increase the work function. Hypotheses on the mechanism of desorption are put forward. 2 illustr, 8 ref.

X *Pdc Ue*

The origin of healing feathers in gemstones. III. Die Entstehung der Heilungsrisse in Edelsteinen. III

W. F. Eppler. *Dtsch Goldschmiede Ztg* 1959 Vol 57 (8) pp 434-436 (Aug) (In German)

Zircon from Madagascar has peculiar healing feathers unlike those in zircon from Ceylon or Mongka. Healing feathers rarely occur in garnet. Occasionally a single stone may contain both an early and a later healing feather. A zircon enclosed in an almandine from Madagascar illustrates the effect of an included crystal on its host. 11 illustr, 5 ref. *A* *Bb Uz*

Adaption of a Dick microscope for orientating crystal fragments

J. E. T. Horne. *Journ Sci Instr* 1959 Vol 36 (7) p 327 (July)

The difficulty of orienting, for x-ray photography, a crystal fragment which shows neither faces nor cleavage may be lessened or eliminated, when the fragment is transparent or birefringent, by first setting it up optically by means of a specially adapted Dick polarizing microscope. The equipment described is also useful for relating optical or crystallographic directions in monoclinic and triclinic crystals. 1 illustr.

D *Ubc Wcme*

DAS 1,052,377 **C. S. Brown, R. C. Kell, L. A. A. Thomas, General Electric Co Ltd**
(June 23, 1954—conv date, Gt Britain)

Method of producing quartz crystals. Verfahren zum Herstellen von Quarzkristallen

The crystals are produced from an aqueous solution containing alkali ions using an inoculating substance of finely divided quartz of high purity or a crystal in the shape of a thin disk cut from a mother crystal with a diamond saw so that the main surface is normal to the Z-axis of the mother crystal. The Z-planes are then finely ground with grade 600 carborundum powder and afterwards placed in a 40% solution of hydrofluoric acid at room temperature for 30 minutes to remove deformed material from its surface. (6 claims, 6 illustr). Ref cited : *Ind Eng Chem* 1950.

J *Bcb Ct.13.545*

DIAMONDS ETC IN INSTRUMENTS

USP 2,878,638 **P. E. R. Fauvelot, Ets Ed Jaeger**
(July 20, 1956—conv date, France)

Sound-proof and shock absorbing bearing for precision mechanisms

The bearing has a support of synthetic rubber or synthetic plastic material in the shape of a cup with a raised bulge inside which the bearing jewels are positioned as represented in Fig 1. Fig 2 shows another

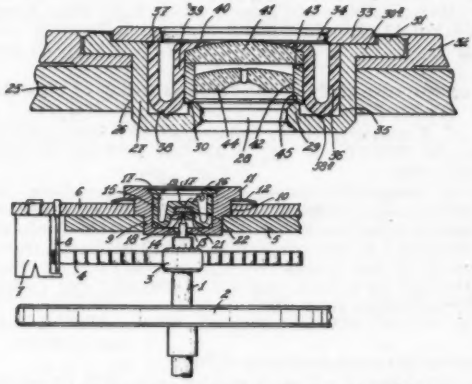


Fig 1 (below) and 2 (above). USP 2,878,638.

arrangement in which the cup has an open bottom bevelled flange 40 holding the jewel. As material for the cup polyethylene sheet is recommended to which a heat treatment is applied by infra-red radiation before cutting and shaping the sheet into a cup. (6 claims, 5 illustr). Ref cited : 1 USP ; 7 Swiss P.

J *Az Ceq Pz.545*

HARDNESS AND WEAR TESTING

Vickers-Knoop hardness conversion discussed

W. Chubb, O. Schaaber. *Met Progr* 1959 Vol 76 (2) pp 114, 116, 118 (Aug)

Comments on article 'Vickers-Knoop hardness conversion', by L. Emond [see *Ind Diamond Abstr* 1958 Vol 15 p A173 (Nov)]. Mr Emond replies to the comments. *W* *Unhcc*

Determining wear in machine parts by the artificial indentation method

M. M. Khrushchov, E. S. Berkovich. *Library of Congress Mthly Index Russ Access* 1959 Vol 12 (4) p 1099 (July) (Original in Russian)

Book, Izd-vo Akad nauk SSSR, Moscow. 1959, 217 pp. [Not in library of Ind Diamond Inf Bur].

W *Az Cw Wgm*

Wear resisting steels for crushers and grinding mills. Valg av slitematerialier for knuse- og malemaskiner

A. A. Pettersen. *Tidsskrift for Kjemi, Bergvesen og Metallurgi* (Oslo) 1959 Vol 19 (4) pp 79-83 (July 8) (In Norwegian)

Discusses the various materials available as wear resisting steels for use in crushers and grinding mills. The choice of the wear resisting steels used in these machines depends not only on the nature of the steels, but also on the physical and chemical nature of the materials treated. While in most cases the wear resisting steel should be as hard as possible, the hardness must in some cases be reduced in favour of toughness. It is pointed out that the problems connected with the choice are very complicated and each case must be treated on its merits. The merits of various alloy-steels are discussed, and examples are given for the selection of particular alloy-steels having regard to the physical and chemical nature of the materials to be treated. 5 illustr.

X *Cl Pr Rw Ungd*

Methods for measuring the hardness of metals and alloys

M. G. Dmitrieva. *Standartizatsiia* 1959 Vol 23 (3) pp 40-42 (Mar); *Library of Congress Mthly Index Russ Access* 1959 Vol 12 (4) p 1072 (July) (Original in Russian)

W *Bf Cv.1456/Bfx Cv.1456*

A co-operative study of the hardness testing of cemented [sintered] carbides

B. M. Caugherty, H. T. Oatman, O. W. Reen. *ASTM Preprint* 1959 (79) 15 pp; *BNF Bull* 1959 Vol 39 (362) p 423 (Sep)

A co-operative study of testing procedures for determining Rockwell hardness has been made by several members of the Cemented Carbide Producers Assoc (USA) and one hardness machine manufacturer, using six test blocks (WC/Co or WC/TaC/Co). Data obtained have been analysed statistically and reasons for variations ascertained.

X *Bkc Cvd Wghc*

Increase the wear resistance of tools

A. V. Pakhomov. *Trakt i sel-khozmash* 1959 (3) pp 40-41 (Mar); *Library of Congress Mthly Index Russ Access* 1959 Vol 12 (4) p 1096 (July) (Original in Russian)

W *Pd Ungd*

Hardness tester

Riehle Testing Machines Div. *Met Progr* 1959 Vol 76 (2) p 31 (Aug)

A portable Rockwell hardness tester has been made for use at any angle. It weighs 3 lb 6 oz, and uses standard indenters and loads. 1 illustr.

A *Wghc*

Wear observations through interfacial micro-windows

R. H. Savage, (GEC Res Lab, Schenactady, New York). *Nature* (London) 1959 Vol 184 (4679) pp 45-46 (July 4)

Micrographic studies of wear in graphite showed the advantages of arranging a sliding contact under a microscope, but the opaque slider hid the contact area. It was found that the slider could be a thin transparent body which then served as a micro-window, allowing the real interface of the contact to be focused upon directly at high magnification. Small glass lenses were first tried as sliders, and, as a further step, a diamond micro-window was machined for the study. This diamond lay completely within the field of view of magnification of 320× so that all contact areas could be seen at once. It showed a detailed picture of surface interactions upon its face during sliding, as well as the topography from the Fizeau fringe patterns. 1 illustr.

D *Bhb Unr:Nmb Wcm.21*

Simple sclerometers for laboratories

Yu. N. Andreev. *Izm tekh* 1959 Vol 20 (2) p 31 (Feb); *Library of Congress Mthly Index Russ Access* 1959 Vol 12 (3) p 791 (June) (Original in Russian)

W *Wgh.264*

TRUING OF GRINDING WHEELS

A way to dress a wheel wafer thin

J. Wain. *Canad Machinery* 1959 Vol 70 (8) p 75 (Aug)

A wheel needed for grinding accurately a deep and narrow slot in a hardened steel workpiece was trued by two diamonds simultaneously and equally on both sides. The truing technique is described. 1 illustr.

D *Ab Cg Nj*

Sixth European Machine Tool Exhibition: grinding machines. 6e Exposition Européenne de la machine-outil : les machines à rectifier

Anon. *Machine-Outil Franç* 1959 Vol 24 (146) pp 171, 173, 175, 177 (Aug-Sep) (In French)

The exhibition will include a machine by Bordier et Gromandzinski—the 'Diafilm' for automatic or semi-automatic use with a shaped diamond following a conical and spherical profile; Constructions Clichy—a truing tool with automatic cycle and diamond equipment in one with the tailstock; Erop—the 'Microbanc' range of machines including one for cutting germanium and silicon by means of a diamond wheel; and also Malicet et Blin—in particular a machine for truing internal surfaces with hydraulic control and either Gage-Matic or diamond Size-Matic gauging. 9 illustr.

A *Nj Pr.27.32*

BP 811,041 (Nov 6, 1956) **F. A. Morris, F. A. Morris (Abrasive Cutters) Ltd**

Grinding wheel dressers

The dresser is of the star wheel type using cutting disks in a holder. Where frequent truing is required the disks wear rapidly so that new disks have frequently to be inserted to replace removed worn disks. Removal and insertion is facilitated by having a holder-handle as shown in Fig 3, 4, and 5 with feet 6 and side cheeks 7 on cover 2 clamped together over disks 21 on a pivot pin in bushes 16 resting in grooves 9, 10. (11 claims, 10 illustr).

J *Cg Pe Psf.545*

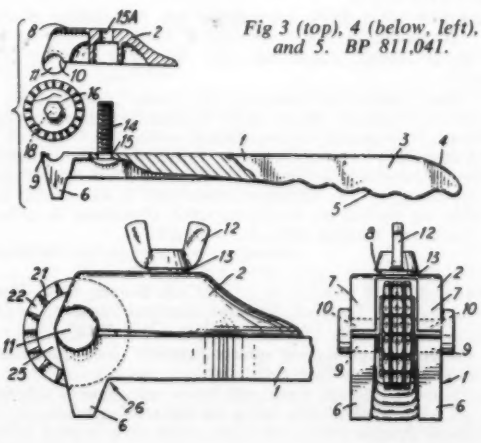


Fig 3 (top), 4 (below, left), and 5. BP 811,041.

USP 2,870,761 (Dec 5, 1956) **F. E. Buczkowski**

Radius and ellipse dresser for grinding wheels

The truing device may be set up for radius truing or for truing an elliptical curve on the periphery of a grinding wheel using ordinary setting means, *eg* verniers or gauge blocks. Fig 6 and 7 show the set-up for truing a radius, Fig 8 and 9 for truing an elliptical curve.

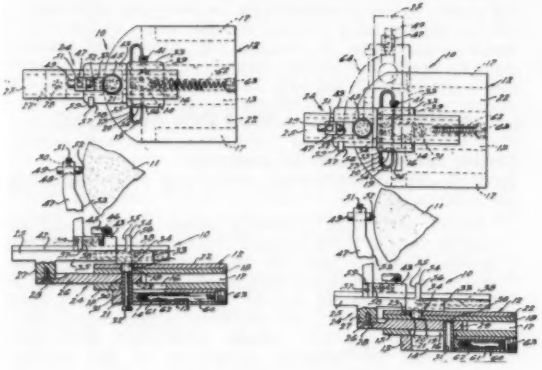


Fig 6 and 7 (left). Radius truing set-up.
Fig 8 and 9. Ellipse truing set-up. USP 2,870,761.

First, the diamond tip 52 is set in holder arm 47 with the diamond point exactly in the plane of reference face 53 in which also lies face 58 on projection 57 on block 43. This face 58 is then adjusted by moving block 43 the desired distance, *ie* radius, from face 55 on projection 54 on slide 25. This face 55 also contains the centre line of pin 32 passing through tubular pin 31 and the tubular projection 34 on slide 25. By swinging slide 25 connected with arm 26 around tubular projection 34 and tubular pin 31 coupled by pin 32, a radius of the adjusted length between faces 55 and 58 is created. For truing an elliptical profile, pin 32 is removed which means, as shown in Fig 8 and 9, that an independent movement becomes possible between projection 34 in slot 19 and tubular pin 31 in slots 14, 16. A swinging action now will cause diamond tip 52 to pass along elliptical curve 64. For truing concave contours, the truing device has to be repositioned 180° from the position shown, and the truing arm is also to be repositioned 180°. The elliptical profile is of importance for the correct grinding of radius cutting tools. As the tool has to be ground with end clearance it is applied to the wheel at an angle to a plane perpendicular to the base of the tool, which means that the wheel profile must not be part of a circle but part of an ellipse. (10 claims, 6 illustr). Ref cited : 2 USP ; 2 GP.

J *Cg Pe Psfc.545*

DIAMOND TECHNOLOGY

First published 1942 as " Production Methods for Diamond and Gemstone." The second edition of this book by P. Grodzinski has been revised throughout and considerably enlarged. 840 pages, 486 illustrations, 94 tables, and indexes. From NAG Press Ltd., 226 Latymer Court, London W 6. 54s 6d, post free.

USP 2,872,913 (Feb 7, 1958) **E. A. Rosier**

Abrading wheel dressing apparatus

Fig 10 represents a section through the apparatus with diamond 38 contacting grinding wheel 40. The apparatus is clamped on a work support 62, the clamping being shown in exploded isometric view, Fig 11. Diamond holder 26 is adjusted in carriage 22 which is moved back and forth along slideway 20 by lever 44 ending in a handle (not shown). Flexible skirt 56 and shield 54 protect the operator and the mechanism against grinding dust. (1 claim, 4 illustr). Ref cited : 2 USP.

J *Cg Pe Psf.545*

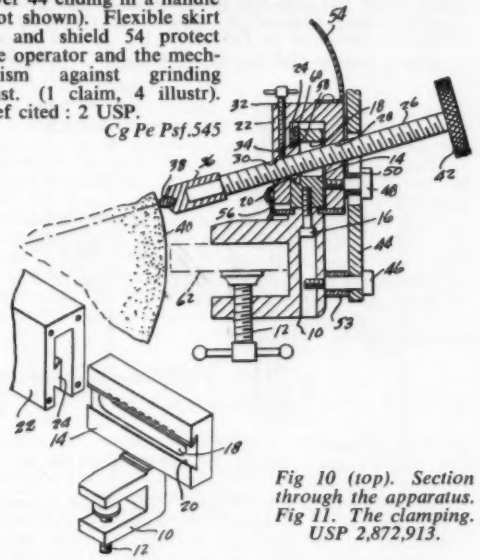


Fig 10 (top). Section through the apparatus.
Fig 11. The clamping.
USP 2,872,913.

USP 2,877,758 (Jan 6, 1954) **A. F. Fassnacht, A. R. Jones, Sheffield-Cleveland Corp**

Machine tool

The essential feature of the machine is a crush truing device working in an automatic cycle which includes moving the crusher roll rapidly to and from engagement with the periphery of the grinding wheel and slowly feeding the roll for crushing, and also compensating the amount of wheel crushed away by correspondingly altering the position of the wheel with respect to the workpiece. Fig 12 is a diagrammatic representation of the crushing structure. The crusher roll 200 is mounted above grinding wheel 110 and rapidly lowered by rack 230 turning gear 225. All movements are electrically controlled and hydraulically operated using limit switches and timers. Truing and grinding alternate automatically in the cycle of operations, electric motor 7A operating the truing device. (14 claims, 24 illustr). Ref cited : 10 USP ; 1 BP.

J *Ab Cgj Psf.545*

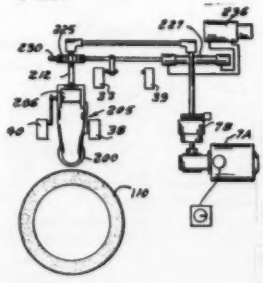


Fig 12. Diagram of device, with crusher roll 200 mounted above grinding wheel 110.
USP 2,877,758.

Swiss P 336,287 (Mar 2, 1955) **L. O. Carlsen, W. C. Critchley, Gleason Works**

Truing device for grinding wheels with at least two truing tools. Abrichtvorrichtung fuer Schleifscheiben, mit mindestens zwei Abrichtwerkzeugen

The two truing tools are pivotable about a common axis but independently of each other and slidably arranged along this axis. A cam carrier is slidable parallel to this axis and the cams produce the rotation of the truing tools when the cam carrier moves in an opposite direction to the tools. Fig 13 and 14 are a vertical section and an elevation of the truing device.

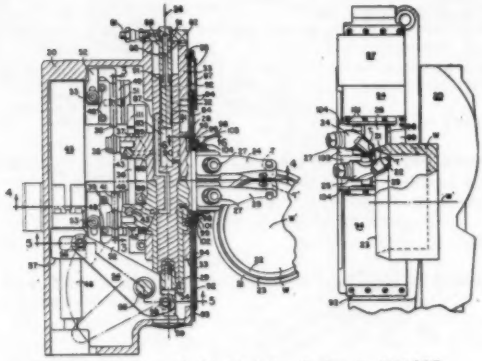


Fig 13 (left) and 14 (right). Swiss P 336,287.

The truing tools are T and T¹ for truing conical end surfaces 21, 22 of wheel, W. Arms 24 and 25 move together in the direction of axis 26 while sweeping independently radially across surfaces 21, 22 ; 45 is the cam carrier with cams 36 and 41 slidably supported on rod 46. Double lever 54 connects the cam carrier with tool holders 28, 29. The reciprocatory movement is hydraulically actuated. (14 claims, 12 illustr).

J *Ab Cg Psf.545*

FP 1,171,887 **S. G. Brady, Gear Grinding Machine Co** (June 25, 1956—conv date, USA)

Mechanism for truing grinding wheels. Mécanisme à tailler les meules

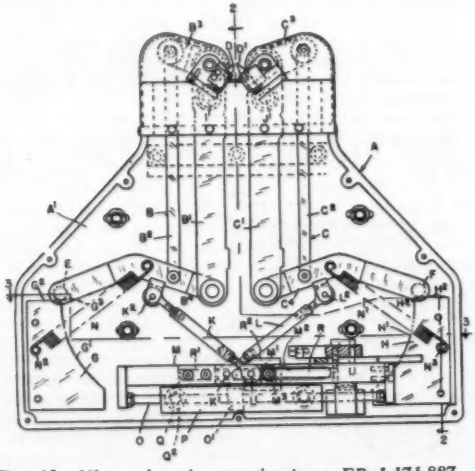


Fig 15. View of truing mechanism. FP 1,171,887.

Fig 15 shows the two diamonds D and D¹ guided by pantographs B and C through feelers E and F rolling along templates H and G. The movement is effected by reciprocating bar M connected to the pantograph mechanisms through links K and L. Their pivot points are K¹ and L¹ which may be adjusted along bar M by block M¹. Bar M is hydraulically reciprocated by piston O in cylinder P. (3 claims, 3 illustr).

J *Ab Cg Nj.545*

FINE BORING AND FINE TURNING

Cutting hard materials with ceramics

D. T. Bisceglia, J. W. Rodd. *Tool Eng* 1959 Vol 43 (2) pp 79-82 (Aug)

Harder structural materials stress sintered carbide cutting tools to the maximum and thus lower machining speeds. Ceramic tools are being used to rough, semi-finish, and finish turn high-strength alloy steels and can perform successfully at over 700 ft/min, yet give good tool life. Although some problems in applying ceramic tooling are not yet solved, laboratory tests have determined the physical properties of the ceramic material, suitable cutting conditions, the need for mechanical clamping against a carbide anvil, and the horsepower and rigidity of the production machinery. Insert-type tips limit re-grinding problems, but grinding the 30° negative land angle with a resinoid-bond diamond-impregnated wheel is recommended. A circle generating fixture grinds tip radii and eliminates the need for form truing the corner radius on the grinding wheel. 5 illustr. *D* *Bfxf Ceq Pdd*

Economical use of precision machines. Wirtschaftlicher Einsatz von Feinstbearbeitungsmaschinen

F. Gruenwald. *Feingeraete Technik* 1959 Vol 8 (8) pp 345-350 (Aug) (In German)

In the mechanical-optical industry precision machining is of two main types : that for decorative purposes, which must achieve a good appearance, and that for obtaining accurate surfaces with small tolerances and satisfying high demands in macrogeometrical form and microgeometrical surface finish.

For decorative purposes the metals used are mainly light alloys and brass. High cutting speeds between 300 and 600 m/min are required, and these demand revolution speeds of 3,000 to 6,000 rev/min, and thus great accuracy in the positioning of the main spindle. The tool is of great importance. For high precision diamond is almost exclusively used. The infeed should be, for preference, fairly large, about 0.060 mm/revolution. The diamond turning methods used prove to be more economical than non-diamond methods.

For obtaining precision ground surfaces the following methods are applicable : precision turning, precision milling, precision drilling, smooth rolling, broaching, grinding, scouring, and lapping. Tests were conducted to compare these methods for degree of accuracy and surface finish in relation to cost. It was found that both with steel and brass, bronze and light alloys, it was possible to carry out grinding operations in which time and cost saving amounted to 50% and more. It was also possible, owing to the greater cutting forces, to avoid various common faults in the process. In precision turning and drilling good results were obtained, and broaching also proved to be an economical method. 12 illustr, 3 ref.

A *Ceq.21*

Machining aluminium and its alloys on automatic turning machines. Die Zerspanung des Aluminiums und seiner Legierungen auf Drehautomaten

W. Scholz. *Metall* 1959 Vol 13 (9) pp 837-842 (Sep) (In German)

Aluminium and its alloys require high cutting speeds. Aluminium alloys are divided into three groups: those inclinded to smearing and therefore requiring tools with wide chip and clearance angles, cleanly lapped cutters, and large and polished chip breaker grooves; those not inclined to smearing, but causing greater wear on the tool; and thirdly, the silumin and other alloys which require the use of sintered carbide and diamond tools and a lower cutting speed. For fine finishing diamonds are used, either faceted stones of about ¼ ct or domed stones being suitable. Various coolants are used, and great care must be exercised in the design of the tools to be applied. Importance is attached to the lapping of the tools themselves, for example the diamond lapping wheel should never come into contact with the tool shank. In setting up a diamond turning tool the usual sighting instrument is inadequate, so that test turning must be done and faults discovered and corrected in practice. Diamond drilling tools are used for finishing drilled holes and the geometry of these tools is slimilar to that of the diamond turning tools. 11 illustr, 2 tables.

A *Bfxc Ceqbb Nf Qs Sj*

Influence of metallurgical properties on metal-cutting operations

F. W. Boulger. *ASTM Res Rep* 1958 (12) 19 pp (May 1): *Battelle Techn Rev* 1959 Vol 8 (7) p 14 (July)

In a general way, the properties measured in tensile tests explain the machining properties of metals. Strength, ductility, strain-hardening characteristics, and hardness are closely interrelated. They depend on composition and microstructure and can be said to affect machinability. However, tensile data are not directly applicable to the cutting process because temperatures, strain rates, specimen sizes, and stress conditions are entirely different. Machining data are far more useful for evaluating the effects of metallurgical properties on cutting operations.

X *Bf Ceg Un*

The mechanism of chip formation

D. Gideon, R. Simon, H. Grover. *ASTE Res Rep* 1959 (9) 8 pp (May 1); *Battelle Techn Rev* 1959 Vol 8 (7) p 15 (July)

Gives theoretical aspects of metal cutting. Discusses the mechanism of formation of the chip at the shear plane in terms of the stresses, the geometry, and the relative velocity of the tool-work combination. Describes dissipation of the input power at chip and workpiece and calculation of temperatures resulting from the energy dissipated.

X *Bf Ceb.21|Bf Ceg.21*

Developments in metal cutting tools

M. T. Galeia. *Library of Congress Mthly Index Russ Access* 1959 Vol 12 (4) p 1101 (July) (Original in Russian)

Book, Gos nauchno-tekhn izd-vo mashinostroit lit-ry, Moscow. 1959, 78 pp. [Not in library of Ind Diamond Inf Bur]. *W* *Bf Ceg Pd.131*

New adaptable automatic thread cutting attachment for use on a lathe. Nouvel appareil à fileter automatique adaptable sur tour

E. Hirsch. *Machine-Outil Franç* 1959 Vol 24 (146) pp 307, 309 (Aug-Sep) (In French)

2 illustr. *A* *Ceqb Pr:Ceqbd Psz*

Cutting of metals; elements of the theory of plastic deformation in the layer being cut

M. I. Klushin. *Library of Congress Mthly Index Russ Access* 1959 Vol 12 (4) p 1101 (July) (Original in Russian)

Book, Gos nauchno-tekhn, izd-vo mashinostroit lit-ry, Moscow. 1958, 453 pp. [Not in library of Ind Diamond Inf Bur]. *W* *Bf Ceg Unkc*

Bright chrome plating of diamond-turned brass parts. Glanzverchromen von diamantgedrehten Messingteilen

P. P. Nowak. *Galvanotechnik* 1959 Vol 50 (8) pp 413-415 (Aug 15) (In German)

Diamond turning is used more and more frequently as a method for preparing surfaces for plating, and owing to the difference in the type of surface obtained a different method of plating must be used. Diamond turned surfaces are very sensitive and must be treated with the same, or more, care as a highly polished surface before the plating process. Not only are the basic ingredients of the brass important, but also the angle of the diamond to the turned surface, which determines the pressure on the surface. Degreasing of the surface is important, and the plating must be chosen to suit the surface.

A *Az Bfxg Ceqb Nf|Az Bfxg Cz Sbz*

Carbide grade selection

W. E. Montgomery. *Carbide Engg* 1959 Vol 11 (8) pp 15-17 (Aug)

Tables show the characteristics of the two general classes of tungsten carbide, straight and alloyed, and also how particle size influences properties of carbide. In general, a powdery discontinuous chip indicates the need for a straight tungsten carbide plus cobalt grade, and a strong continuous chip demands a more highly alloyed type. 5 illustr, 3 tables.

D *Rgd.18.513*

Grinding eliminated by ceramic boring

Anon. *Metalworking Prodn* 1959 Vol 103 (33) p 1230 (Aug 14)

Faster production and finer finish resulted when steel gear blanks were bored with ceramic tools. Details are given of tests on rough-machined, hardened and shot-blasted steel blanks, and rough-machined hard-cast bronze blanks of the same size. Tools used were ¼ in. Stupalox bits with 3/32 in. nose radius, clamped in a 1¼ in. boring bar. 1 illustr.

D *Ad Bfd Cfd Pdd*

Small batch production on automatic lathes

Anon. *Machine Shop Mag* 1959 Vol 20 (7) pp 386-391 (July)

Examples of the application of hydraulic copy turning equipment on single spindle automatic lathes. 6 illustr.

X *Ceqb Prs*

Multi-edge tool bits

Anon. *Machine Shop Mag* 1959 Vol 20 (7) p 411 (July)

Pre-ground tool bits enable cutting tool changes to be made more quickly. Using a ready formed grinding wheel of the profile required four edges of a standard high-speed steel tool bit are ground. The profile produced on each edge of the tool bit forms the top rake of the cutting edge combined with a chip-breaker groove. The bit is mounted in a special holder. In many cases the ends of the tool bit can be ground off square so that the trailing clearance angle is eliminated, and thus eight cutting edges can be used in succession before re-grinding is necessary. 1 illustr.

A *Alz Bfdg Chch*

Swiss P 335,993 (Apr 9, 1957) **G. Mauri**

Method of securing a drilling needle in the drilling spindle of drilling machines for watch and industrial jewels. Verfahren zum Befestigen einer Bohrnadel an der Bohrerwelle von Uhren- und Industriesteinbohrmaschinen

A piece of wire of thermoplastic material (nylon, Grillon, Perlon) is inserted in the needle sheath (brass) which is then heated to soften the material. The needle is pushed into the softened material. On cooling the material hardens so as to hold the needle tightly until softened again by heat to remove the worn needle. The needle sheath may be shortened by filing to enable full use of the needle until completely worn down. (2 claims, 2 illustr). *J* *Cfd Pr Tc.545*

FP 1,172,155 **F. L. Kirkham, General Electric Co** (Feb 1, 1956—conv date, USA)

Mounting for cutting tools. Montage pour outils de coupe

The replacement of hard metal tools, especially of those used in mining operations, is often difficult because of the fine dust filling all interstices. The destruction, *eg* of screw threads, therefore, is a frequent occurrence when trying to loosen a tool. Easy and quick replacement is made possible by using a permanent magnet in the tool holding appliance. Grooves are provided for evacuating dust and detritus, and lever action is used for separating tool and magnet for replacement. (1 claim, 7 illustr). *J* *Al Cr.545*

CUTTING AND MACHINING OF GLASS

USP 2,878,567 **T. Hofman, C. W. Hofman** (July 31, 1954—conv date, Netherlands)

Apparatus for cutting spectacle-glasses

The apparatus belongs to the type using the spectacle frame rim itself as template. Known devices are not accurate enough for fitting new lenses into old frames. Fig 16 is an elevation of the apparatus of which details are shown in Fig 17 and 18. A spectacle frame 16 is clamped on rectangular table 5 in Fig 19, while in Fig 18 a template is shown with follower 47 guiding cutter 58 on swing frame 44 to cut lens blank 80. Cutter 58 is secured on pin 53, Fig 20, by block 59 mounted on pin 60; 62 is an intermediate adjusting block. Follower 47 may swing under the lens table held in contact within a rim 16 of a frame, or with an outside template. (8 claims, 12 illustr). Ref cited: 1 USP; 1 FP; 1 GP; 2 DBP. *J* *Bm Ceq Tfbz.545*

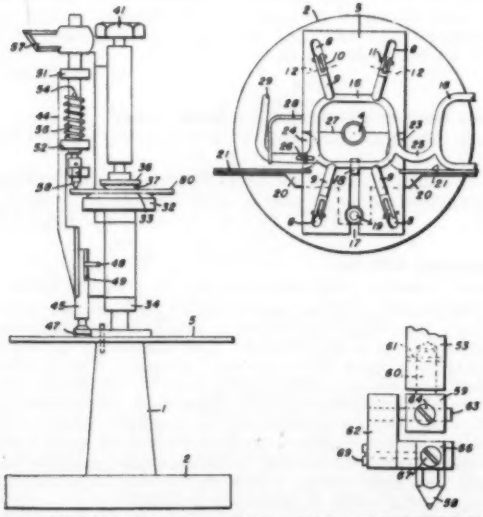


Fig 16 (left), 17 (top, right), and 18. USP 2,878,567.

USP 2,871,627 (May 22, 1957) **R. B. Bringelson, E. M. Katzenberg, Robinson-Houchin Inc**

Lens edging machine

The machine is fully automatic and produces a finished edge either bevelled or flat in the desired outline. As seen in Fig 19, the grinding wheel 32, preferably a diamond wheel, is horizontally arranged and provided with bevelling grooves in one of which the lens L is shown rotatably carried on pin 93 and

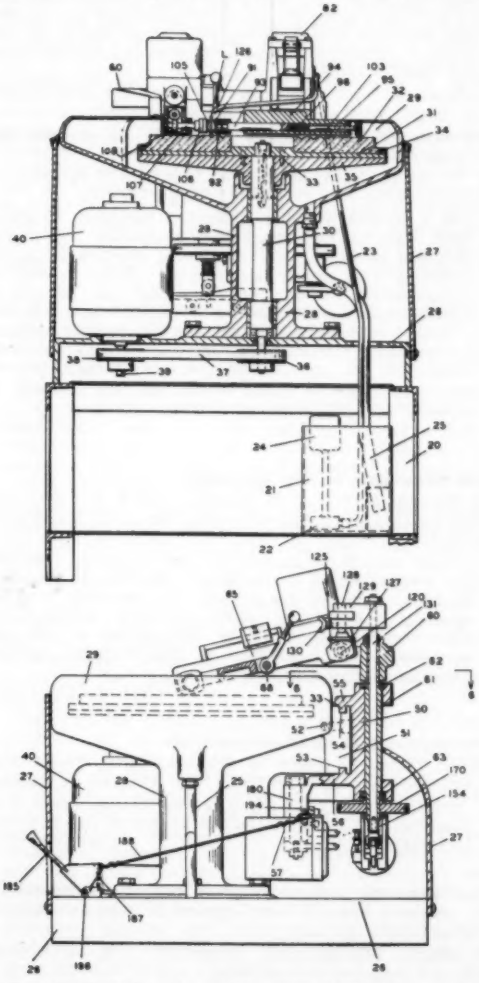


Fig 19 (above) and 20. USP 2,871,627.

rotated by a mechanism including worm gear 108. Fig 20 is a vertical section of the machine showing the swing arm 65 and the supporting yoke for movement in a horizontal plane around standard 50. If a rimless type of lens is to be ground the lens is not allowed to drop in one of the bevelling grooves after finishing the profile. For lenses to be inserted in frames the groove of the desired profile is chosen to finish the bevel, and the lens is automatically guided into this groove. The pattern is 125, Fig 20, controlling the movement of swing arm 65 through follower plate 127. The pattern 125 is rotated by drive 120 through means not shown in this figure. A traversing mechanism is first adjusted for guiding the lens into one of the three or more grooves. (15 claims, 12 illustr). Ref cited : 9 USP.

J *Bm Chcs Pr Tfb.545*

MACHINING OF STONE, ETC

Germanium rectifier production

Hewittic Electr Co. *Min Journ* 1959 Vol 252 (6452) pp 415-416 (Apr 17)

See *Ind Diamond Abstr* 1959 Vol 16 p A112 (June). 2 illustr. *W* *Bfr Wec.13*

Carbide burs oust steel in dentistry

F. Inglis. *Canad Machinery* 1959 Vol 70 (8) pp 69-73 (Aug)

Recent advances in the development of small high-speed air turbines have made possible the use of super-hard tungsten carbide dental drills, which operate at up to 400,000 rev/minute. Such burrs were made in Germany over 40 years ago, and diamond wheels were developed to cut the blades. Present day manufacture of carbide burrs with steel shanks involves machines for cutting and fluting heads equipped with diamond wheels. 7 illustr.

D *Az Ceq Nv/Pld.131*

USP 2,877,988 (May 3, 1957) **H. M. Cameron, E. S. Wassel, American Coldset Corp**

Drill bit with driven auxiliary bit

In conventional drill bits the cutting velocity of the diamonds is proportionate to their distance from the centre line of drill. At zero, no, or hardly any, cutting occurs. More uniform cutting is obtained by incorporating an auxiliary drill bit as shown in Fig 21 and 22. The main drill bit with its cutting faces 26 and 27 is mounted at the end of shank 13. The auxiliary bit body 33 is independently rotatable by gear 41 meshing with ring gear 24 on sleeve 15 freely rotatable on shank 13. Sleeve 15 carries three sets of star wheels around its circumference, one set of which 18, 19, 20 is shown, which on lowering the drill cut key-ways K so that sleeve 15 does not rotate with shank 13 while auxiliary bit 33 is rotated in the opposite direction to the main drill by gear 41 rolling on stationary ring gear 24. (6 claims, 4 illustr). Ref cited : 2 USP.

J *Bn Cfb Nhb Pr.545/Bn Cfb Pl Pr.545*

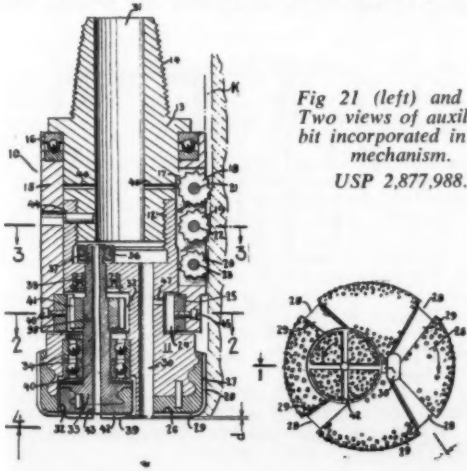


Fig 21 (left) and 22. Two views of auxiliary bit incorporated in the mechanism.

USP 2,877,988.

GEM POLISHING

Agate and gemstone products from Idar Oberstein. Achat- und Edelsteinwaren aus Idar-Oberstein

W. Roemer. *Dtsch Goldschmiede Ztg* 1959 Vol 57 (8) p 450 (Aug) (In German)

Agates were formed by the action of water and silicates on chips, and cracks and bubbles in stones, producing patterns and colours which are emphasized by polishing and cutting. The industry in Idar Oberstein was helped by the invention of the diamond saw for cutting and the diamond wheel for grinding and polishing. 1 illustr.

A *Bb Cg Nt/Bb Chc Nv/Bb.25.322/Bcbc.25.322*

Doublets. Dubletten

F. Bauss. *Dtsch Uhrmacher Zeits* 1959 Vol 63 (8) p 363 (Aug) (In German)

Gemstones can be mounted with either a piece of glass or a less valuable stone forming the girdle between the upper and lower facets, or forming the lower half of the jewel. Such combinations as emerald on glass, aquamarine with a girdle of green glass, or diamond on zircon are used. 4 illustr.

A *Bb Cr/Fb Hm*

ROCK DRILLING

Technical and economic effectiveness of drilling small diameter wells

M. Yu. Askerov, A. B. Gasanov. *Azerb neft khoz* 1959 Vol 38 (1) pp 47-48 (Jan); *Library of Congress Mthly Index Russ Access* 1959 Vol 12 (4) p 1115 (July) (Original in Azerbaijani, summary in Russian)

W *Az Cfb.21*

Drilling small diameter wells

A. N. Babikov. *Neft khoz* 1959 Vol 36 (2) pp 19-22 (Feb); *Library of Congress Mthly Index Russ Access* 1959 Vol 12 (4) p 1115 (July) (Original in Russian)

W *Az Cfb*

Kinetics of rock destruction when using roller bits

R. A. Badalov. *Izv vys ucheb zav ; neft i gaz* 1958 Vol 1 (10) pp 35-40; *Library of Congress Mthly Index Russ Access* 1959 Vol 12 (4) p 1115 (July) (Original in Russian)

W *Bn Cl Plz*

A diamond drill

Consolidated Pneumatic Tool Co. *Min Journ* 1959 Vol 252 (6460) p 652 (June 12)

The CP-65 air-powered diamond drill is suitable for core and blast hole drilling ; capacity is 600 ft using EW rods and EX fittings. A reversible motor speeds up screwing and unscrewing of rod joints.

W *Cfb Nh*

Lightweight diamond core-drill

Bucyrus-Erie Co, Drill Division, Richmond, Ind. *Min Congr Journ* 1959 Vol 45 (5) p 95 (May)

The Winkie portable diamond core drill for exploration and test hole work weighs 45 lb and is 19 in. high and 21 in. wide. Maximum bit speed is 2,000 rev/minute. In shallow drilling the Winkie can recover cores up to 8 in. in diameter, and 15/16 in. cores can be recovered down to 200 ft. A water swivel is built in. 1 illustr. *A* *Nhe Prw*

Diamond drillhole deflection at Rosebery, Tasmania

V. M. Cottle. *Australasian Inst of Min & Met, Stillwell Anniversary Vol* 1958 pp 67-75 (Dec)

A prominent feature of diamond drilling at Rosebery is a deflection which causes drillholes to curve round towards normality with the well developed cleavage. Records of this behaviour have been kept for many years, and the information is used in laying out drillholes to obtain accurate intersection of targets without using the expensive technique of wedging. 5 illustr, 2 ref. *X* *Cfb Nh.28*

Development of cemented [sintered] tungsten carbide tipped drill steels

C. Dahlin. *Min Journ* 1959 Vol 252 (6444) pp 194-196 (Feb 20)

3 illustr. *W* *Pl Rhb.132*

The saga of oil

A. Howard. *Engs Digest* 1959 Vol 20 (8) pp 299-324 (Aug)

This article on the growth of the oil industry mentions the development of drilling techniques and tools. Illustrations compare three rotary drill bits, including a diamond bit, with a bit used in an early stirrup-type drill, and with two modern cable-tool bits. 14 illustr, 4 tables.
D *Az Cfb Nhb.131/Az Cfb Plb.131*

Possibility of drilling greatly deflected wells using bent sectioned turbodrills

A. A. Movsimov. *Azerb neft khoz* 1959 Vol 38 (1) pp 20-21 (Jan); *Library of Congress Mthly Index Russ Access* 1959 Vol 12 (4) p 1115 (July) (Original in Russian)
W *Az Cfbd Pl*

A laboratory study of rock breakage by rotary drilling

W. H. Somerton. *AIME Petroleum Trans, Journ Petroleum Technol* 1959 Vol 11 (5) pp 92-97 (May)

A series of laboratory tests was made using two-cone 1.25 in. diameter bits to drill vertically upwards into rock samples at controlled weights and rates of rotation. Effects of bit wear, size, and geometry were examined, and the drilling chips were analysed. Efficiency of rotary drilling as a rock breakage mechanism was extremely low. 11 illustr, 10 ref, 3 tables.
A *Bn Cfbr.21*

Determination of the drillability of rocks based on the specific destructive energy

V. I. Tarasevich. *Izv vys ucheb zav; neft i gaz* 1958 Vol 1 (10) pp 29-33; *Library of Congress Mthly Index Russ Access* 1959 Vol 12 (4) p 1115 (July) (Original in Russian)
W *Bn Unx*

Mining submarine ores

Anon. *Min Journ* 1959 Vol 252 (6445) pp 223-224 (Feb 27)

It is suggested that it might be possible to develop a diamond drill which could be operated by a diver on the sea bed. *W* *Be Cfb Nh.132*

Notes on the technique of rotary drilling

Anon. *Nafta* 1959 Vol 15 (3) pp 78-80 (Mar) (In Polish)
3 illustr, 4 ref, 1 table. *A* *Cfbr.21*

USP 2,879,037 (June 10, 1955) **N. E. Wolfram**

Rock drill bit

The percussion drill bit has a pilot cutter at the forward end and a plurality of carbide inserts as gauging strikers symmetrically arranged around the axis and in between concentric groups of intermediate strikers, each group disposed longitudinally of the bit axis in progressively raised levels. All inserts are angularly spaced and supported on lobe-like portions relieved inwardly and rearwardly as seen in Fig 23,

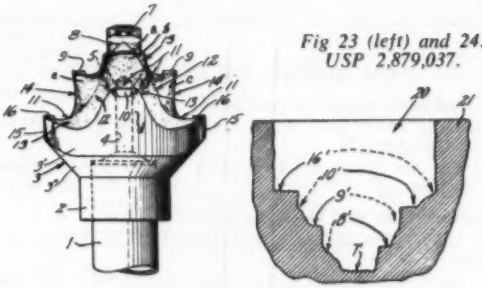


Fig 23 (left) and 24. USP 2,879,037.

showing a bit with pilot cutter 7, gauging strikers 16, and three groups of intermediate strikers 8, 9, 10, each consisting of two opposed carbide inserts and each group angularly spaced 90° from the inserts of the next group. Fig 24 illustrates the operation of the bit. (3 claims, 6 illustr). Ref cited: 8 USP; 1 Austral P.
J *Bn Cfbf Pl Rh.545*

DAS 1,053,446 (Feb 15, 1954) **B. Kurtz**

Two-wing rotary drill with inserts of hard metal for drilling minerals or the like. Mit Hartmetallplaettchen bestueckter zweifluegeliger Drehbohrer zum Bohren von Mineralien od dgl

Two-wing drills as designed previously, even those with asymmetric arrangement of the wings or those showing different distances from the centre line of the drill, do not form a core that breaks and crumbles during further drilling so enabling fast progress. The

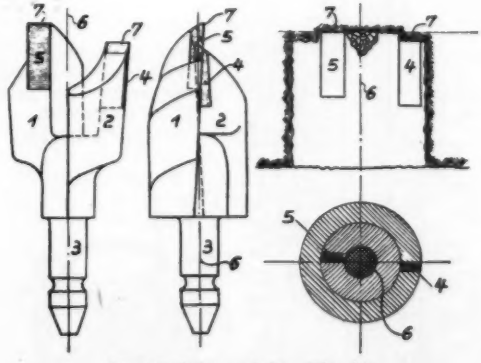


Fig 25 (left) and 26. The bit.
Fig 27 (top, right) and 28. Effect of the drill.
DAS 1,053,446.

new drill also has asymmetric wings but the wing arranged nearer to the centre line of the drill projects further longitudinally than the wing which is farther from the centre line, thus compensating for the theoretically different torque at the cutting edge. The bit is shown in Fig 25 and 26. Fig 27 and 28 are a representation of the effect of the drill. (1 claim, 9 illustr). Ref cited : 6 GP ; 2 DBP ; 1 G Appl ; 2 BP ; 1 periodical *Glueckauf* 1934 ; 1 pamphlet *Widia-Hartmetall* 1951. *J* *Bc Cfd Pl Rh.545*

DAS 1,053,447 **D. W. Haglund, Sandvikens Jernverks AB**

(June 28, 1954—conv date, Sweden)

Hard metal body for rock drills with a zone of harder and with a zone of less hard but tougher hard metal. Hartmetallkoerper fuer Gesteinsbohrer mit einer Zone aus haerterem und einer Zone aus weniger hartem, aber zaeheren Hartmetall

Hard metal inserts with zones of different hardness are known. The insert is characterized by a wedge-shaped section of the zones so that the tougher zone becomes larger in the direction from the cutting edge towards the bottom of the insert as seen in Fig 29 to 32, where 12 is the zone of harder metal, 13 the zone of tougher metal. A number of variants are depicted in the further sections shown in Fig 33 to 41, Fig 37 and 41 showing an intermediate zone 14. It is also possible

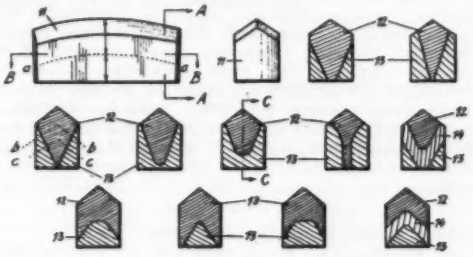


Fig 29 to 32 (above, left to right), 33 to 37 (centre), and 38 to 41. DAS 1,053,447.

to produce the insert with a gradual transition of hard to tough material. The inserts have a greater wear resistance than those of previous designs and thus last longer. (7 claims, 20 illustr). Ref cited : 2 DBP ; 1 Swiss P ; *Bergbau-Rundschau* 1954.

J *Bn Cfb Pl Rh.545*

WIRE DRAWING

UR Joh Urbanek & Co

Anon. *Indian Wire Ind Journ* 1959 Vol 2 (7) pp 101-103 (July)

UR diamond drawing dies can be supplied with a suitable drawing angle for any material to be drawn, and, it is claimed, give outstandingly smooth finish and highest accuracy of dimensions. Steel casings enclose the raw diamond form with a high compressive pre-load and thus counteract forces originating when drawing wire : this means that larger bores with lower diamond weights can be delivered. The importance of using suitable drawing liquids and of repolishing the diamond draw plates is stressed.

UR also supply tungsten carbide draw tools, including dies for drawing wires of 0.006 in. to 0.315 in. diameters, draw rings for the drawing of rods and tubes of diameters from 0.197 in. to 3.15 in., and draw dies for profile, tube, and rod drawing.

D *An Cn Pxb/Nkb*

Measuring instruments for drawing dies

Anon. *Indian Wire Ind Journ* 1959 Vol 2 (7) pp 98-100 (July)

Special instruments have been developed for measuring and inspecting polishing needles, drawing angles, and blend radii on the approach side, as well as bearing lengths and the surface finish of die contours. The Zetmeter uses the two needle principle to measure the blend radius and the cylindrical portion of the die profile or die bearing, miniature dial indicators limiting travel of the gauging needle and thus eliminating the effect of hand pressure. Measuring range is 0.008 to 0.31 in. bore diameters, and under shop conditions the operation takes about 20 seconds. A taper indicator checks polishing needles, with taper angles from 5° to 30°, in about six seconds. The Panhol instrument examines surfaces of die bores, using a pin with a conical reflecting surface which can check even small diameter holes satisfactorily. All instruments are designed for practical use in wire drawing shops. 6 illustr. *D* *Px V W*

Wet wiredrawing

J. K. Annandale. *Wire Ind* 1959 Vol 26 (308) pp 741-743, 745-746 (Aug)

4 illustr. *W* *Cn Pr*

Advanced lubricants and pressure dies for better wire drawing

E. A. Bowers jun. *Wire & Wire Prod* 1959 Vol 34 (8) pp 953, 1021-1024 (Aug)

W *An Cn Sk/An Cn Tbz*

Beryllium wire

Brush Beryllium Co. *Met Progr* 1959 Vol 76 (2) pp 23, 25 (Aug)

Pure beryllium wire has been drawn successfully under laboratory conditions, using standard wire drawing equipment and a specially designed pre-heat furnace. Drawing temperature, die design, crystallography, and the use of a proper starting material appear to be the most critical variables in the process.

A *An Bfn Cn.21*

Tungsten for electric lamp filaments

D. J. Jones, A. Leach. *Metallurgia* 1959 Vol 60 (357) pp 7-11 (July)

The extraction of the metal from its ores and its manufacture into filaments by compacting, sintering, swaging, and wire drawing are described briefly, and factors influencing the stability of metallographic structures are discussed in relation to the service behaviour of the lamp. Diamond dies replace carbide dies at approximately 0.3 to 0.5 mm wire diameter. 6 illustr, 6 ref.

W *An Cn Nkb/Sbz Tz:Qc*

A new layout saves space in feeding wire to fine drawing machines

Anon. *Wire Ind* 1959 Vol 26 (308) p 752 (Aug)

2 illustr. *W* *Pld Rg*Pld Rw*

GRINDING AND POLISHING OF HARD METALS

Balancing of motors for precision grinding machines

G. T. Mercer. *Machine Shop Mag* 1959 Vol 20 (7) pp 417-419 (July)

1 illustr. *W* *Chc Pr Psz*

Spherical surfaces microhoned within .003" sphericity in 2 fast operations

Anon. *Cross-Hatch* 1959 Vol 11 (2) pp 2-4 (July-Aug)

Micromatic have developed a machining method which can be applied to any type of spherical surface, so long as the part is held without touching the sphere, and the heat-treatment leaves it in a machinable state. The new equipment is already being used for completely machining heat-treated forged ball studs in two operations taking a total of 39 seconds. A cutting tool, designed to machine every point on the spherical surface at the same speed, removes 0.068 in. stock, with sphericity held to a total error of 0.0005 inch. Microhoning then removes the final 0.002 in. stock, generating the required size, final sphericity within 0.0003 in., and a consistent microinch finish of 6-10 rms. General advantages claimed are greater productivity and economical operation. 5 illustr.

D *Az Ceq Ck*

Finishing hard materials at 300,000 rpm

T. W. Black. *Tool Eng* 1959 Vol 43 (2) pp 55-57 (Aug)

Spindle speeds in the 300,000 to 400,000 rev/min range and improved efficiency in precision finishing operations on small workpieces are claimed for a new pneumatic tool, the Airotor. Among applications already developed is the machining of carbides using diamond mounted points. 4 illustr.

D *Bk Ceq Nqh*

Device for lapping large micrometers

A. F. Chadaev, E. V. Navskii. *Izm tekh* 1959 (3) p 16 (Mar); *Library of Congress Mthly Index Russ Access* 1959 Vol 12 (4) p 1071 (July) (Original in Russian)

W *Az Chd Psc*

New natural diamond grit

Diamond Res Lab, Johannesburg. *Min Journ* 1959 Vol 252 (6461) p 677 (June 19)

A new natural diamond grit for resin-bonded grinding wheels is claimed to increase grinding efficiency by 40%. A new type of diamond for drilling gives longer life to diamond drills.

W *Cfb Kl Nh/Kl Nv Urb*

Threading on a tool and cutter grinder

H. J. Gerber. *Machinery* (NY) 1959 Vol 65 (12) pp 122-123 (Aug)

External thread grinding can be done by a tool and cutter grinder equipped with a fixture which both revolves and advances the work in a helical path. The fixture is designed for work of given outside diameters and thread pitch, and is therefore more suited to quality-lot grinding than for a single piece. The machine table also carries a thread truing device. 3 illustr.

D *Al Chcp Pr*

Proper mounting of diamond wheels

C. H. Hill. *Grinding & Finishing* 1959 Vol 9 (4) pp 35-36 (Aug)

Discrepancies in the size of wheel spindle and diamond wheel bushing can cause the wheel to 'drop' when mounted. This can be overcome by packing with shims or by evenly positioning the wheel before fully tightening the flanges.

W *Nv Qz*

Grinding of carbide tools at high temperatures. L'affutage à haute temperature des outils au carbure

E. Zmihorski. *Machine Mod* 1959 Vol 53 (605) pp 23-24 (Aug) (In French)

See *Ind Diamond Abstr* 1959 Vol 16 p A12 (Jan); p A89 (May). 3 illustr.

W *Al Bkc Cg*

Straddle-bearings provided in new centerless grinder

Norton Co. *Grinding & Finishing* 1959 Vol 5 (4) pp 24-25 (Aug)

The No 2 straddle-bearing centreless grinder has a straddle-bearing spindle for both the grinding wheel and regulating wheel, and dual mobile wheel heads which ride on friction ways. Wheelhead adjustments can be made in increments of 0.00005 in., and the hydraulically powered grinding wheel truing permits truing of a 90° step in the wheel without special equipment. The capacity of the grinder is 1/16 to 4¼ inches.

The horizontal motion of the truing slide is controlled by gibbed anti-friction ways which ensure consistent truing speed of the diamond. The amount of diamond feed is selected by a graduated handwheel, while the coolant line through the ram directs the coolant to the point where the diamond is truing. 3 illustr.

A *Chcc Pr Psnz*

Belt grinding titanium

C. T. Olofson. *Light Met Age* 1959 Vol 17 (5, 6) pp 6-7 (June)

Titanium reacts with oxygen and nitrogen in the air to harden the surface at high temperatures, and the metal tends to weld to the abrasive grains of a belt during grinding. The consequent wear of the belt, allowing the flattened abrasive grains to slide over the titanium surface, causes excessive heat to generate. This characteristic, together with the low thermal conductivity of titanium, frequently causes burning of the ground surface. The most important factors for successful belt grinding are therefore low speeds and a satisfactory coolant, preferably water-based. Silicon carbide coatings are usually used for the abrasive belt, with a waterproof backing if water-coolants are used. Rubber contact wheels are usually recommended. 1 table.

A *Bfn Chc Pee Rgc*

Precision plating lowers grinding costs

Anon. *Metalworking Prodn* 1959 Vol 103 (33) pp 1231-1234 (Aug 14)

The need to minimize finish grinding costs in the production of vacuum brake piston rods led to the replacement of a manual installation by a Canning Rotomatic plating unit, specially adapted for the semi-automatic deposition of a 0.012 in. coating of heavy nickel along the length of the piston rods. The rotation of each rod at 2 rev/min while travelling round the vat, and the placing of twin adjustable polythene barriers between the anodes and the rods, ensured a maximum thickness variation of 0.004, compared with between 0.020 and 0.025 in. over the lower 2 in. of rod by the previous method. Pretreatment of the rods, ancillary features of the Rotomatic, and production control are described. It is claimed that besides the achievement of closer tolerances of thickness, hardness, and uniformity, the new installation has resulted in high output, low labour costs, and very low reject figures. 6 illustr.

D *Agg Chpb Unf*

Norton adds centerless grinder to line

Norton Co, Worcester, Mass. *Machine & Tool Blue Book* 1959 Vol 54 (8) pp 139-140 (Aug)

A machine was developed according to suggestions made by various users of centreless grinding machines as to what features they would like to see in a new design. A combination of manual and hydraulic operation is used in the truing device. The diamond is fed by hand and a lever controls the hydraulic truing stroke. The wheel grinding speeds are adjustable from 8 to 66 rev/min, and quickly set by the turn of a knob. 1 illustr.

A *Chcc Pr:Ni Psf*

Sharpening broach tools and their care. Das Schaerfen von Raeumwerkzeugen und deren Pflege

H. Cornely. *Werkstatt & Betrieb* 1959 Vol 92 (8) pp 481-493 (Aug) (In German)

Precision is of the utmost importance in sharpening broach tools, as it is impossible to compensate for irregularities in the shape of the tool by adjusting its position in the machine. The angle and shape of the teeth are the most important points to consider during finish grinding, and they vary according to the material used. The methods of polishing or sharpening are very different for flat and round tools. Different machines are used to perform these two processes. 36 illustr, 6 ref. *A* *Ale Chc Pr*

7-station crankpin grinder requires little operator attention

Norton Co, Worcester, Mass. *Grinding & Finishing* 1959 Vol 9 (4) pp 43-44 (Aug)

The Norton No 2 unitized transfer type automatic crankpin grinder finish grinds pins on up to 60 automotive type crankshafts per hour. The seven grinding stations are connected by a transfer system, and all grinding, loading, unloading, size control, gauging, and wheel truing is done automatically. Automatic truing forms fillet radii. 2 illustr.
W *Az Chc Prs*

Preparing foil for micro-examination

D. J. Rahn. *Met Progr* 1959 Vol 76 (2) pp 109-111 (Aug) 4 illustr. *A* *Az Bf Cz*

The behaviour of diamond grinding wheels in grinding sintered carbide. Das Verhalten von Diamant-Schleifscheiben beim Schleifen von Hartmetall

G. Pahlitzsch. *VDI Zeits* 1959 Vol 101 (25) pp 1181-1189 (Sep 1) (In German)

In the consideration of the performance and economics of diamond grinding wheels working on sintered carbide, various influences must be taken into account. Apart from the structure of the grinding wheel, as regards bond, type of diamond, grain size, and concentration of diamond, it is above all important to examine the grinding speed, surface pressure, condition of sharpness, and coolant. These are operative values for the degree of abrasion, the specific grinding wheel wear, and the grinding cost. 39 illustr, 11 ref.
A *Bkc Chc Nv Uqe*

Grinding problem surmounted

The Raytheon Corp, Waltham, Mass. *Diamond News* etc 1959 Vol 22 (10) p 13 (July)

The problem of grinding the new ceramics has been solved by the use of diamond grinding wheels. Five automatic grinders have been equipped with metal-bonded wheels with natural diamond powder as the grinding agent. *A* *Bl Chc Nv Urc*

Drill grinder

Wickman (SA) (Pty) Ltd, Brakpan, Transvaal. *SA Min & Engg Journ* 1959 Vol 70 Pt 2 (3468) p 287 (July 31)

The Nippy rock drill grinder mounts on workshop bench, lorry deck, wheelbarrow, etc, and produces a standard cutting edge angle of 115°. Angles of 110° or 120° can be produced by adjusting the mounting.
1 illustr. *W* *Alb Chc Pr*

Difficult milling operations performed with carbide cutters

C. Sharp, B. Main. *Machinery* (London) 1959 Vol 95 (2440) pp 284-286 (Aug 19)

4 illustr. *W* *Cff Pdc*

75,000 rpm hand grinder

M-F Engg, Blue Island, Ill. *Machine & Tool Blue Book* 1959 Vol 54 (8) p 205 (Aug)

The high speed of the new M-F air jet hand grinder ensures smooth operation and less wheel wear. A push button stop brake and a speed regulator for rotary files and burrs are features of the grinder. Maximum wheel diameter is to $\frac{1}{4}$ inch. 1 illustr.
A *Chc Prw*

Handlaps, wheels and paste

B. O. Morris Ltd, Briton Rd, Coventry. *Electroplating* etc 1958 Vol 11 (12) p 455 (Dec)

The firm has extended its field of production to cover lapping tools and accessories, Macolaepp hand laps, wheels, and paste, which are made in Germany. The Macolaepp products are claimed to render diamond hand laps unnecessary. *A* *Chd Pg.322*

Grinding milling cutters. Schleifen von Fraeswerkzeugen

Anon. *Technik & Betrieb* 1959 Vol 11 (8) yellow insert pages (Aug) (In German)

Continuation, 3 illustr. *A* *Alc Chc*

The Sixth European Machine Tool Exhibition : sharpening, grinding, polishing, honing, and surface finishing machines. 6é Exposition Européene de la machine-outil : Les machines à affûter, meuler, polir, roder et surfacer

Anon. *Machine-Outil Franç* 1959 Vol 24 (146) pp 177, 179, 181 (Aug-Sep) (In French)

Amongst a variety of machines are some employing diamond : Chomienne's machine for sharpening tools and milling cutters with a diamond wheel to produce a sub-micron surface finish ; Deltal's new developments of the Préciform, one of which allows the use of a diamond wheel, and the other, with a variable head, is suited for sharpening big milling cutters. 8 illustr.
A *Al Chc Nv Pr.27.32*

USP 2,867,060 (Nov 9, 1956) **L. Coes jun, Norton Co**

Centerless grinder

The grinder is specially adapted for rapid grinding of long shafts with a grinding wheel rotating much faster than hitherto possible. It operates with a cup wheel

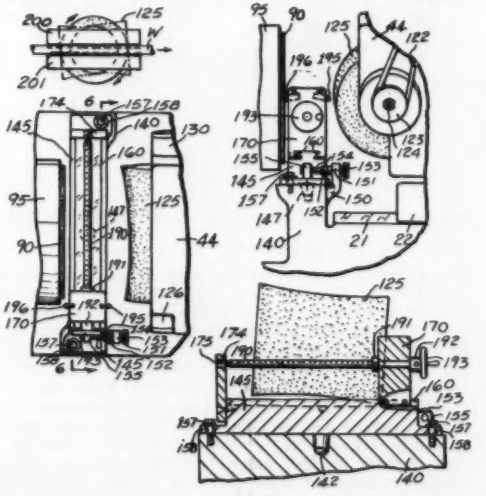


Fig 42 (top, left), 43 (below, left), 44 (top, right), and 45. USP 2,867,060.

opposite an elongated regulating wheel arranged across the cup wheel to provide two grinding stations as shown in Fig 42.

Truing is effected by diamond tools 195 and 196, shown in Fig 43, and 44, arranged on truing slide 170. Usually one wheel will be trued at a time. A tapered hyperboloid can be formed of the regulating wheel 125 by setting swivel table 145 on pivot 142 at the required angle to be read on the scale. The diamonds are moved across the wheels by hand wheel 193. Grinding has been done at 6,000 surface ft/min and upwards by grinding wheel 90, but not in excess of 10,000 surface ft/min at a spindle speed of 6,350 rev/minute. Wheel segments 90 are phenol-formaldehyde resin-bonded, while regulating wheel 125 may be of the rubber-bonded type. A surface speed of wheel 125 of 1,000 ft/min is preferred. (20 claims, 11 illustr). Ref cited : USP ; 1 GP ; see also USP 2,459,923 for regulating wheel shape.

J *Agz Chcc Pr:Nj Psf.545*

USP 2,867,063 (Feb 28, 1956) **L. H. Metzger, Super-Cut Inc**

Multiple grinding wheel

The wheel is mainly intended for grinding glass without danger of chipping or fracturing the workpiece. Fig 46 is a front view showing the arcuate segments 22, 35, and 40 arranged in three concentric annuli 9, 10 and 11. The abrasive parts 24 of annuli 9 are diamond particles of 100 to 140 mesh embedded in a matrix.

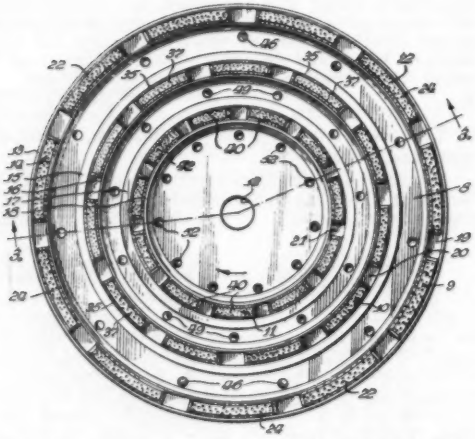


Fig 46. A front view of the wheel. USP 2,867,063

The forward surfaces of the abrasive parts 24 are flat and may be rounded in a radial direction. The outer and inner arcuate sides are bevelled so that the segments are of progressively decreasing radial width in a forward direction to permit rapid grinding without likelihood of chipping the glass. The end of the abrasive parts are likewise bevelled, thus increasing grinding efficiency. Abrasive parts 37 of annulus 10 are of medium, *ie* 170 to 200, mesh for effecting medium grinding of glass, and abrasive parts 42 of annulus 11 are of fine, *ie* 320, mesh for fine grinding. Liquid coolant is supplied through ducts 46, 49, and 52. The coolant also has a cleaning action. Besides grinding glass, the wheel is also suitable for grinding marble, stone, and ceramics. (10 claims, 6 illustr). Ref cited : 14 USP ; 1 GP. *J* *Bm Chc Pe.545*

USP 2,869,294 (July 2, 1957) **S. A. Boettcher, J. C. Page, Abrading Systems Co**

Lapping machine

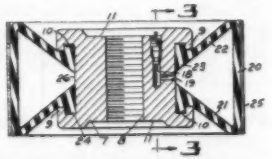
In lapping parts of thin cross-section, working temperatures of 140 deg F and upwards are often encountered at the surface of the horizontal lapping wheel, and as the workpieces are confined in a defined area of the rotating lapping wheel held in engagement by a weight plate, the existence of high lap surface temperatures becomes particularly likely to distort the workpieces, especially with thin workpieces having different temperatures on their opposite surfaces. This danger is avoided by a system of cooling the lapping wheel so as to maintain it within a normal room temperature range of 70 to 80 deg Fahrenheit. Fluid conducting passages are formed by wedge shaped wear segments superposed on the lapping base plate for circulating coolant between the segments underneath the wheel. (7 claims, 5 illustr). Ref cited : 7 USP.

J *Chd Pr.545*

USP 2,870,582 (Oct 2, 1956) **A. Raske**

Inflated grinding wheel

The wheel has a rigid solid core 7 shown in cross-section in Fig 47 with an inflatable drum 20, 21, 22 with flanges 24 fitting snugly into groove 10 of drum 7. An abrasive band 25 embraces the drum which is forced when inflated through passages 18, 19 under pressure against the band. (4 claims, 4 illustr). Ref cited : 6 USP. *J* *Pe.545*



USP 2,871,625 (Mar 31, 1955) **R. E. Price, Gardner Machine Co**

Surface grinding machine

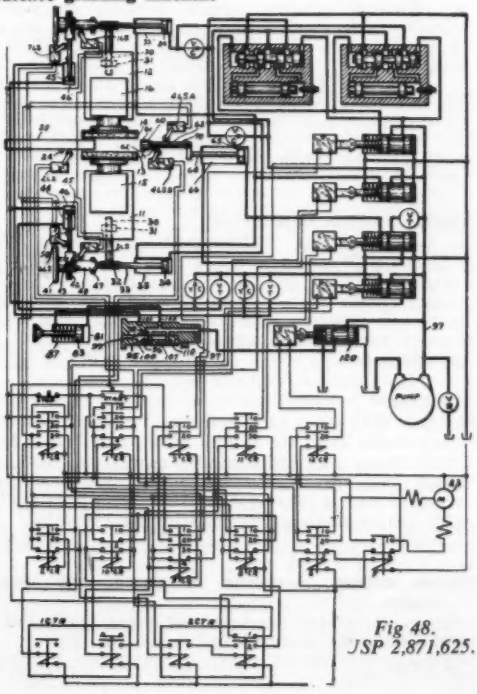


Fig 48. USP 2,871,625.

In disk grinders with opposed annular faced grinding wheels for grinding both sides of a workpiece simultaneously, the problem of removing the same amount of stock from both sides of the workpiece, often required because of a centre line to be maintained, is difficult to solve as the wheel wear differs. Periodic adjustments and frequent measurements are very time consuming. The difficulties have been overcome by the arrangement of a diamond truing head with two diamonds equidistant from the centre line periodically fed between the opposite faces of the wheels which are periodically advanced towards the centre plane. Fig 48 shows the diamond head 60 with diamonds 61 and 62 and wheels 13 and 14 with workpiece support 20 in a diagram of the electrical and hydraulic system. (7 claims, 6 illustr). Ref cited : 2 USP ; 1 BP.
J *Chem Pr:Nj Psf.545*

USP 2,871,633 (Sep 26, 1956) **C. Klingspor**

Grinding bodies

Grinding disks having a layer of abrasive covered fibrous material attached to a steel plate may cause accidents when used in high speed machines if the grinding ring breaks and is thrown off the supporting disk. It is imperative that the attachment should be absolutely secure. The steel plate is therefore replaced by a support formed from compressed layers of fibrous material ; the abrasive part formed from layers of abrasive-covered fibrous material and the support are bonded together by a hardened synthetic resin. In one form, shown in Fig 49, grinding rings of alternately

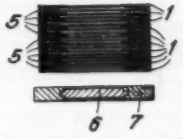


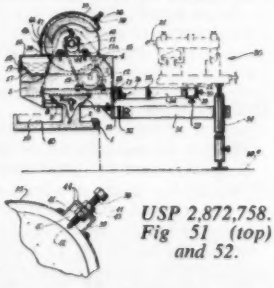
Fig 49 (top) and 50. The grinding body before and after compression. USP 2,871,633.

smaller and larger internal diameter are bonded together with supports of corresponding layers and smaller external diameter to produce a grinding body under heat and pressure, as shown in Fig 50, comprising the supporting member 6 and grinding member 7. (3 claims, 9 illustr). Ref cited : 4 USP.
J *Pe.545*

USP 2,872,758 (Oct 3, 1957) **V. N. Hoerst**

Mounting for grinding devices

Two arms are hinged to the grinding device to support a tool holder arrangement. Fig 51 is a side elevation, partly in section, of the mounting. Wheel support 4 is adjustable on base 1, 2. The support carries arms 24 and 31 on hinges 27 and 32. Arm 24 also has an intermediate hinge 25 so as to permit positioning of tool holder 20, whose weight is taken by jack 34. The hood of the wheel carries a truing device, details of which are shown in Fig 52. Truing tool 38, 42 is laterally movable to traverse the wheel face, and hood 35 can be adjusted by bolts in slots 46, 47 to conform to the decreasing diameter of the wheel. (3 claims, 3 illustr). Ref cited : 6 USP.
J *Cr Pr.545*



USP 2,872,758. Fig 51 (top) and 52.

USP 2,873,560 **O. Bretscher, Ges der Ludw von Roll'schen Eisenwerke AG**

(Aug 10, 1953—conv date, Switzerland)

Grinding machine

Feeding of cup grinding wheels by threaded spindle and nut in a direct path usually results in a jerky advance and leads to overshooting of the desired dimension which at the end of the grinding may be only 0.002 to 0.003 mm. An efficient and accurate feed control is obtained by co-ordination of the wheel feed and the feed of a truing device and co-ordination of two gauging devices operating electrical signal means. Fig 53 is a section through the grinding wheel attachment, Fig 54 a section at right angles to Fig 53. After vertical adjustment of slide 4 by turning spindle 8, cup wheel 14 in rest 10 is inclined in pivots 9, Fig 54, towards workpiece 62 and fed towards the workpiece by worm gear 21 without rotating bush 15. Parallel to bush 15 is bush 30 with rotatable and axially shiftable rod 32 carrying arm 33 with diamond 34. Before each grinding the grinding wheel is trued (see dash-dotted line showing truing position of diamond 34). To set the grinding allowance Z, dial micrometer 63 is first applied to workpiece 62, then, after shifting the table with the workpiece, to template 61 to read the difference Z. This reading is transferred by hand to second dial micrometer 57, adjusting it to operate switch 58a somewhat before the set dimension is reached. With the feed motion of bush 30 pin 57a presses switch 58 to cause it to change over. This interrupts the motor circuit, and thus the infeed, and a signal lights up. The operator knows that only one more stroke is required. The wheel now receives a final touching up by diamond 34 which has been fed exactly the same distance. It is advantageous to change the feed for the final stroke by inserting additional gears between motor 50 and shaft 52. On the preset position being reached, switch 58 is automatically operated, cutting out the motor and lighting a signal lamp. (16 claims, 4 illustr). Ref cited : 6 USP.
J *Chc Pr Psf.545*

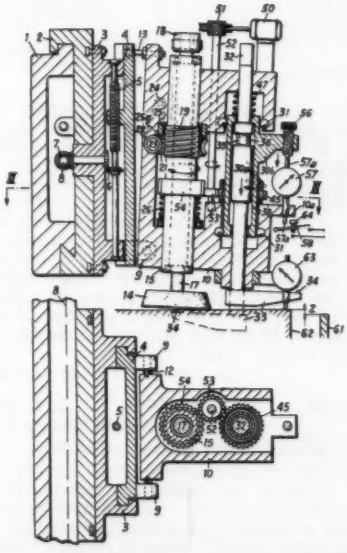


Fig 53 (top). The attachment. Fig 54. Section at right angles to 53. USP 2,873,560.

USP 2,875,559 (Oct 30, 1956) **C. L. Garrison, Oliver Instrument Co**

Method of grinding and grinding wheel therefor

A tool bit of tungsten carbide is easily burned when in contact with a conventional grinding wheel because of the high frictional heat developed. The cutting edge may be chipped or broken and the surface of the wheel 'glazed' by the contact with the hard material. Burning and glazing can be avoided by having a wheel with transversely arranged slots effecting successive impacts while the tool itself is vibrated towards and away from the wheel. It has been found that the edge of the tool may not be sharpened to the desired degree because of the wheel engaging the tool in a linear area. The specification now describes a method in which the contact between tool and wheel is a point contact. The grinding wheel as shown in Fig 55 in an isometric view is provided with slots 100 and 110 inclined in alternate directions which have the effect of progressive shearing actions resulting in more uniform grinding. By the

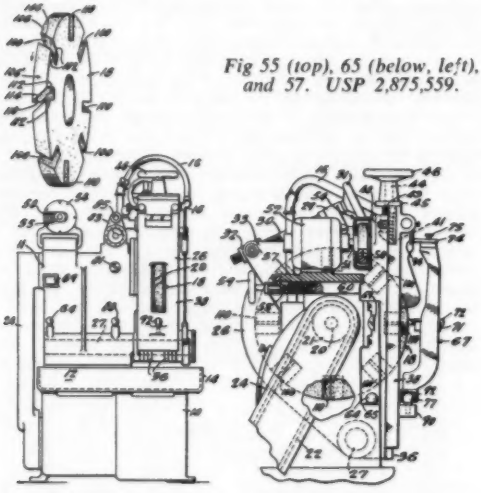


Fig 55 (top), 65 (below, left), and 57. USP 2,875,559.

succession of impacts in alternate opposed directions vibrations are set up in the tool whereby the abrasion efficiency is increased. The extent of movement of the tool towards the wheel is restricted by using a template on a ball support which is first ground to the required shape. Fig 56 and 57 are front and side elevational views of a grinding apparatus for this purpose. Wheel 50 is used for grinding template 74 mounted on ball 64, which then is transferred to ball 92 to guide tool bit 72 by the template 74 brought into contact with straight edge 94. 81 and 85 are gauge blocks for adjusting the position of tool bit 72 in tool and template holder 67 placed on ball 80 for this purpose. (4 claims, 7 illustr). Ref cited : 9 USP ; 1 BP.

J *Al Bkc Chc Pe.545*

USP 2,876,086 (June 21, 1954) **A. E. Raymond, Minnesota Mining & Mfg Co**

Abrasive structures and method of making

Fig 58 illustrates diagrammatically a method by which abrasive particles are uniformly individually spaced, oriented, and anchored in a flexible backing sheet. The sheet 10 is pulled from supply roll 11 through adhesive applying rolls to roll 17 where it meets a masking web containing regularly spaced apertures so that a laminate is formed. This laminate then travels under hopper 18 from which abrasive particles drop onto the masked backing sheet. On its way round drum 21 and along

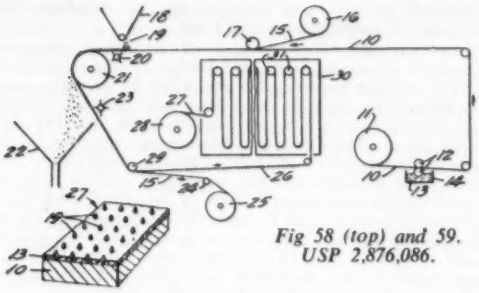


Fig 58 (top) and 59. USP 2,876,086.

beater 23 excess abrasive is shaken off. On rounding roll 29, mask 15 is stripped off and wound up on roll 25. The movement of mask 15 results in orienting the abrasive particles adhering to the backing sheet. The composite material 26 passes on into oven 30 for the curing operation and the cured sheet is wound up on storage roll 28. Fig 59 is a perspective view of the finished structure. (12 claims, 7 illustr). Ref cited : 7 USP.

J *Az Cz Rd.545*

USP 2,877,103 (Dec 7, 1954) **R. O. Lane, M. & M. Research & Development Co**

Artificial abrasive articles

A self-dressing abrasive article (with controlled 'glazing') is produced by using an additive in the form of pellets of loosely or weakly bonded abrasive grains dispersed in the firmly bonded matrix of the article. These grains are readily dislodged during use and then function as a freed fracturing agent for the main abrasive grains. (4 claims). Ref cited : 6 USP ; 2 GP ; Webster's Dictionary 1940.

J *Pe Qc.545*

USP 2,877,105 (June 27, 1957) **I. B. Smith, Norton Co**

Vitrified bonded grinding wheel with fine hard sides

Vitrified wheels with a fine hard side are not easy to produce because of the warping which occurs in the firing of such wheels, which are used for special work such as grinding burrs for cutting small holes, grinding the lips of drills, grinding aircraft rivets to have a sharp shoulder, and other sharp corners. The hard sides should be thin and of uniform thickness. The abrasive grains may be alumina, silicon carbide, zirconia, diamonds. It has been found that the fine hard side should consist of a coating of fused abrasive, its major proportion being fused crystalline metal oxide (gamma aluminium oxide ; cubic zirconium oxide) having a sharp melting point, the remainder being selected from the fused crystalline metal oxide and the vitrified silicate bond. The coating is flame sprayed *in situ* on the wheel. (9 claims, 5 illustr). Ref cited : 2 USP.

J *Nv Urf.545/Pe Rgc Urf.545/Pe Rj Urf.545/Pe Rz Urf.545*

USP 2,878,171 **M. Ferrand**

(Apr 18, 1955—conv date, France)

Method of manufacturing abrasive surfaces by electro formation and the products obtained thereby

Successive layers of abrasive particles are deposited on a moving endless belt carrier in a cyclical process while simultaneously and continuously depositing bonding metal on the carrier by electrodeposition completely to enclose the layers of abrasive material. At the end of the operation the carrying belt is removed. The abrasive tool may then be used as a band saw after its faces have been ground to expose the abrasive grains. Other shapes may also be produced by electro formation with appropriate masks. (2 claims, 2 illustr). Ref cited : 5 USP.

J *Pee Urb:Qc.545*

USP 2,879,630 (Aug 3, 1955) **A. Aeppli, Maag Zahnraeder & Maschinen AG**

Grinding of gear-wheels

The teeth are produced by the generating motion of the workpiece between two grinding wheels. A cylindrical or arcuate element connected with the workpiece rolls in known manner along stretched tapes. The two grinding wheels do not participate in the generating motion but they are displaced to a small extent, *eg* to compensate for wear of the wheels and to round off the tip and root of each tooth to compensate for bending under load, to avoid shocks on re-engagement. It has now been found desirable to round or camber the ends of the flanks of the teeth because of distortion of the teeth, especially in the case of pinions of greater length than diameter, also advantageous if the gear elements are likely to change their position under load. This rounding off is effected by a cam controlled displacement of the two grinding wheels independently of each other when in engagement with the ends of the flanks of the teeth. (9 claims, 12 illustr). Ref cited : 3 USP ; 1 BP.

J *Ad Chc Pr.545*

USP 2,880,080 (Nov 7, 1955) **W. J. Rankin, B. F. Tungseth, Minnesota Mining & Mfg Co**

Reinforced abrasive articles and intermediate products

A self-supporting felted mat is made from a randomly oriented uniform mixture of 20 to 80% (weight) of short bundles of aligned glass fibres encased in a sheath of flexible film-forming polymer and 80 to 20% (weight) of short moisture-swellable impregnation resistant cotton thread segments. A heavy duty disk wheel may be made by uniformly distributing abrasive grains throughout at least one layer of a preformed compressed mat within a cured (triallyl cyanurate based) resinous matrix binder. The sheath encasing the glass fibres may also be of rubbery butadiene acrylonitride copolymer. Another example mentions epoxy resin, phenol-formaldehyde resin, diethylene triamine accelerator, and 24 mesh aluminium oxide grains. (11 claims, 3 illustr). Ref cited : 6 USP.

J *Pee Qc.545*

USP 2,880,081 (Sep 3, 1953) **W. R. Eubank**

Honing stone and method of making

Certain water-soluble inorganic bonding agents alone or in conjunction with other bonding agents together with abrasive grits or particles are formed into a granular and free-flowing but pressure coherent mixture, compacted to the desired porosity and dried. The blank formed can be roughly handled as it has a surprisingly high green strength. It can be fired to the final full strength with no change in the dimensions. As an example, 400 mesh aluminium oxide grain is uniformly moistened with 1½ parts of an aqueous 50% solution of monoaluminium phosphate $Al(H_2PO_4)_3$, to which is then added a pre-formed mixture of 4½ parts of powdered frit and 1½ parts of ball clay. The ingredients are mixed and passed through a screen. The resulting unitary mass is pressed in a mould, dried at 300 deg F, cut, and shaped into segments of the desired size ; it is finally fired at about 2,000 deg F whereby frit and clay form a vitreous bond. (6 claims). Ref cited : 6 USP.

J *Pz Qc.545*

Swiss P 335,959 **W. Osenberg, Bisterfeld & Stolting** (June 12, 1954—conv date, Germany)

Grinding tool for grinding workpieces of high strength and hardness by means of abrasive grains carrying strips inserted in a carrier disk. Schleifwerkzeug zur Bearbeitung von Werkstuecken hoher Festigkeit und Haerte mittels in einer Traegerscheibe eingelassener, mit Schleifkoernern bestueckter Streifen

Previous tools of this kind have been made with metal inserts in which diamond chips are embedded. The new tool does not have rigid inserts, but has flexible abrasive strips mounted on edge and adaptable for hard (coarse) and soft (finish) grinding simply by adjusting the clamping devices securing the strips on the carrier disk to let the strips project more or less from the clamping device, and by providing strips with coarser or finer abrasive grains. The mechanical grinding action may be combined with stock removal by electro-erosion (electrolytic, spark, arc erosion), the strips, or the clamps in case of non-metallic strips, serving as electrodes. Fig 60 and 61 are a section through the tool and a plan with the rotating disk 6 carrying the strips *k* in their clamping rings 3 and 4. The strips are visible

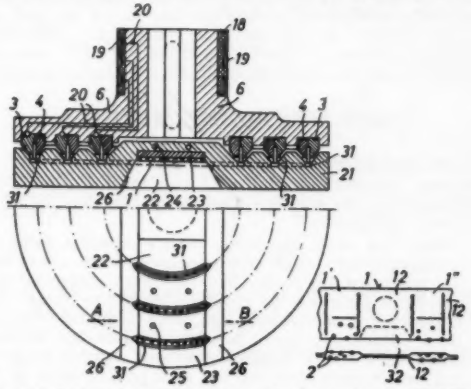


Fig 60 (left), 61 (top, right), and 62. Swiss P 335,959.

in Fig 61 in recesses 31 of transverse channel 22, in stationary cover plate 21 through which the hard material workpiece to be ground is engaged by the strips. The strips as seen in Fig 62 contain diamond grains 2 embedded between weldable foils. 12 are thin sections for facilitating welding, for removing grinding dust, and for a continuous interruption of the current in spark erosion. (9 claims, 8 illustr).

J *Bk Chc Nvg.545*

FP 1,173,345 **E. Peinetti, SAIT (Soc Abrasivi Industriali Torino)** (July 23, 1956—conv date, Italy)

Reinforced abrasive disk or wheel and its method of manufacture. Meule ou disque abrasif renforcé, et son procédé de fabrication

The wheel as shown in cross section in Fig 63 is made up of a number of layers. The base layer 3 is a resistant cellulose layer, preferably a vulcanised fibre, supporting a layer 4 of abrasive (fused alumina ; silicon carbide) grains of various sizes in a (thermosetting) bond superposed by a layer 5 of, *eg* glass fibre or nylon. This

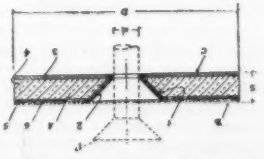


Fig 63. The wheel shown in cross section. FP 1,173,345.

upper layer 5 carries another layer 6 of abrasive grains with free points attached to the layer by an adhesive. A conical aluminium insert 2 is fitted in the aperture for connecting with shaft 1. (8 claims, 3 illustr).

J *Pe Qc.1456.545*

DAS 1,052,852 (Feb 5, 1955) **J. H. C. Andrew, Nicol & Andrew Ltd**

Grinding tool. Schleifwerkzeug

The tool is intended for the internal grinding of large bores. It is a cross-shaped body formed of two spaced parallel plates as holders for crosswise arranged parallel sets of arms, one above the other, which are radially movable. The upper and lower arms are connected by parallel grinding or honing stones at their outer ends. (1 claim, 5 illustr). Ref cited : 1 GP.

J *Chc Nv.545/Chc Pe.545/Chh Nv.545/Chh Pe.545*

DAS 1,053,348 (June 12, 1954) **W. Osenberg**

Grinding tool. Schleifwerkzeug

See Swiss P 335,959. (4 claims, 4 illustr). Ref cited : 2 GP ; 1 Belgian P ; 1 USP.

J *Pe.13.545*

NEW MACHINING METHODS

Spark machining development

Burton, Griffiths & Co Ltd, Mackadown Lane, Birmingham 33. *Machine Shop Mag* 1959 Vol 20 (7) pp 425-426 (July)

With the new Sparcatron rotary impulse generator equipment for rough stock removal, work capabilities are increased by from 10 to 20 times compared with results obtained on the standard Mark 3 machine. This is dependent on the area and material of the electrode used. The equipment includes, besides the standard machine, a rotary impulse generator capable of giving a pulse frequency of 400/sec at a peak output of 250 amps. A switch incorporated in the control unit will change the equipment from rough to finish machining. 2 illustr. *A* *Ceqm.132*

Increasing the efficiency of the electric spark cutting of metals

V. N. Kondratenko, T. I. Makeeva, S. M. Moreiskii. *Library of Congress Mthly Index Russ Access* 1959 Vol 12 (4) p 1051 (July) (Original in Russian)

Book, Leningr dom nauchno-tekhn propagandy, Leningrad. 1958, 18 pp, (Informatsionno-tekhnicheskii listok no 42). [Not in library of Ind Diamond Inf Bur].

W *Bf Ceqm*

Using an electric spark method in making recesses and openings in metal

E. M. Levinson & coll. *Library of Congress Mthly Index Russ Access* 1959 Vol 12 (4) p 1051 (July) (Original in Russian)

Book, Gos nauchno-tekhn izd vo mashinostroit lit-ry, Moscow. 1952, 93 pp, (Bibliotechka-elektrotekhnologa No 4). [Not in library of Ind Diamond Inf Bur].

W *Bf Ceqm*

BP 810,457 (Mar 19, 1954) **Cavitron Corp**

Vibratory machine tools

In the ultrasonic machining process, a tool is vibrated at ultrasonic frequencies while pressed against the workpiece and a finely divided abrasive in a liquid carrier flowing about and between tool end and workpiece. Particular applications require tools with a relatively large cross-section and it is difficult to obtain maximum amplification of vibration amplitude with the present type of transformer. In tools of small cross-section, maximum stress in a tapered holder does not occur at a nodal point, thus mechanically weakening the holder. Now it has been observed that if a half wavelength acoustical impedance transformer comprises portions of equal acoustical quarter wavelength of the same material, the relative masses of the portions determine the position of the plane of maximum axial stress in the transformer and modify the vibration amplitude at the output end in the proportion of the cross-sectional areas of the input and output ends. Thus the new transformer is constructed with two (three) integrally aligned portions of different cross-sectional areas so that the maximum axial stress occurs in the region of the junction of the portions (within the first portion). A series of transformers may be used acoustically connected. (17 claims, 12 illustr). See BP 602,801 (Ultrasonic machining).

J *B Ceqr Pr.545*

USP 2,868,947 (Apr 20, 1956) **E. M. Williams, C. P. Porterfield, Firth Stirling Inc**

Spark machining apparatus

The apparatus is designed for 'external' or outside spark machining. It operates with an electrode wheel of conducting material, *eg* cast iron, with a number of interlaced spiral grooves in its face for receiving a semi-solid dielectric material (a micro-crystalline petroleum wax called petrolatum) arranged on a mounting disk which is included in the spark machining circuit with a co-axial slip ring and a contactor engaging the slip ring and a multiple conductor line. A fan removes fumes produced during spark machining. (2 claims, 9 illustr). Ref cited : 6 USP ; 3 GP ; 2 FP.

J *Ceqm Pr.545*

USP 2,871,177 (Mar 16, 1953) **G. E. Comstock III, Norton Co**

Electrolytic grinding apparatus

A desirable characteristic of supply of direct current for the electrolytic circuit is one where the voltage across the grinding wheel interface is maintained constant up to the point where the current flow approaches a critical value, then to reduce the voltage (to zero) to prevent reaching the critical value. Further, a controlled conversion of alternating current to direct current energy at the grinding wheel interface in response to work conditions is also important to achieve constant current flow, especially when using diamond abrasive in the grinding wheel as excessive wheel wear through excessive current flow may make the costs prohibitive. It is preferable to use only a thin layer of diamond grains in a metal bond in relation to the overall thickness of the grinding wheel. A concentration of 25% diamond in a bond of a mixture of 82% copper and 18% tin provides excellent conductivity. (3 claims, 6 illustr). Ref cited : 5 USP ; report Nat Res Council 1952 ; *Steel* 1952 ; see also : USP 2,101,787 (electrolytic grinding machine) ; USP 2,381,034 (same, especially for shaping tool bits).

J *Chcr Pr.545/Chcr.21.545*

Swiss P 336,137 (Sep 3, 1956) **G. E. Bromberger, Ateliers des Charmilles SA**

Machine for machining a workpiece of conductive material by means of electric sparks. Machine pour l'usinage d'une pièce en matière conductrice au moyen d'étincelles électriques

The control of the efficiency of a machine of this kind may be effected by a voltmeter connected in parallel with the condenser forming the electrostatic element. Because of its inertia the voltmeter indicates a middle tension, and oscillations of its needle show that something is wrong. However, it may happen that the condenser is not properly charged owing to a shunt between tool and workpiece which the voltmeter does not show. For this purpose, the control means comprise also an electric lamp with its light dependent on the tension between electrode and workpiece. (8 claims, 5 illustr). *J* *Bz Ceqm.545*

POWDER TECHNOLOGY

New method for the determination of grain or crystallite size from spotty diffraction rings

K. W. Andrews, W. Johnson. *Brit Journ Appl Phys* 1959 Vol 10 (7) pp 321-325 (July)

In contrast to previously proposed methods for determining grain size from x-ray diffraction rings which employed back-reflexion photographs, the new method uses transmission photographs. The specimen is also oscillated through a known angle. Possible confusion between Laue and Debye-Scherrer spots is therefore avoided, and adjustment of experimental conditions to give a suitable number of spots enables a wide range of grain sizes to be covered. The angular divergence of the x-ray beam can be eliminated and the volume of specimen irradiated accurately estimated. The effects of grain-size distribution on visibility and blackening of spots are considered, and a graphical method is proposed which takes account of grains at the surface and within a specimen. 3 illustr.

X *Vgf*

Rapid estimation of the specific surface of a powder

H. E. Rose, R. M. E. Sullivan (King's College, London). *Nature* (London) 1959 Vol 184 (4679) pp 46-47 (July 4)

The 'single observation photo extinction method' of estimating the specific surface of a powder in the sub-sieve size range gives results accurate enough for many industrial purposes, if the equations used to calculate the specific surface of the material are modified. Certain limitations remain, and it is pointed out that the correction equations are deduced for materials having a fairly wide range of size. 1 illustr.

D *Vgf*

Standard samples of glass spheres for calibrating sieves

Anon. *Techn News Bull (NBS)* 1959 Vol 43 (8) pp 148-149 (Aug)

The problem of calibrating sieves has been one reason for the discrepancies found when comparing particle size analyses from different laboratories. Glass sphere standards have been developed which permit easy measurement of the effective opening of a sieve in any laboratory equipped for normal sieving operations. 3 illustr, 3 ref. *D* *Az Bm Cpz Pq*

TOOL PRODUCTION

Specialization in making blanks for cutting tool holders

G. I. Shandrenko. *Vest mash* 1959 Vol 39 (3) p 78 (Mar); *Library of Congress Mthly Index Russ Access* 1959 Vol 12 (4) p 1096 (July) (Original in Russian)

W *Psp*

BP 810,865 (July 3, 1954—Germany) **E. Bisterfeld (Bisterfeld & Stolting), W. Osenberg**

Cutting tools or cutting elements for tools

When forming tools with hard particles between metal sheets or foils, which are welded together, it is of decisive importance that the hard particles are compactly embedded without air space between particles and sheets (foils). The welding is often effected by electric resistance welding in a matrix to prevent the sheets from flowing away. Such a matrix can be dispensed with by welding together only one or more regions of one of the sheets (foils) so that those parts of the metal sheets (foils) which are heated and become dough-like are kept well defined by the parts of the sheets (foils) which remain unheated. The regions which are heated are those where hard particles are incorporated, *eg* diamond grains or hard metal powder. The method can operate with high welding pressure and short heating periods so that even high temperatures do not affect the particles. Very large separating disks with hard particles only in the rim zone can easily be produced by a series of single welding operations. (11 claims, 5 illustr). *J* *Pd.545*

USP 2,867,137 (Nov 9, 1954) **W. R. Joy**

Cutting tools and method of making same

A bead of tungsten carbide is applied to the flat end surface of a tool and allowed to cool. Further beads are then successively applied until a cutting tip is formed. The method may be used for making tungsten carbide tipped rock drill bits as shown in Fig 64 where

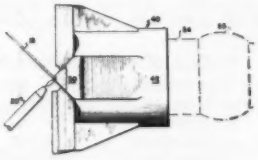


Fig 64. Illustration of method, with rod 18 and torch 20. USP 2,867,137.

18 is a rod of tungsten carbide in a soft binder (copper plated steel) and 20 an oxy-acetylene torch. (4 claims, 8 illustr). Ref cited : 12 USP.

J *Al Bk Chc.13.545/Pd.21.545*

SURFACE FINISH TESTING

A method of testing optical flatness of pre-polished glass surfaces

A. Shahul Hameed, S. Hariharan. *Journ Sci & Ind Res* (India) 1959 Vol 18A (7) pp 311-313 (July)

A method for the quantitative estimation of the form of an optical surface, just before polishing, is described. The optical lever with suitable modifications has been used for the purpose, so that departures from a standard form, say an optical flat, could be evaluated in terms of wavelengths of light. This data will be helpful in correcting surfaces even in the pre-polishing stages. The time spent in effecting the corrections at this stage will be very much less than the time taken in the figuring stages, after polishing. The results obtained by the method are verified by interference methods. 4 illustr, 1 table. *X* *Bm Vs*

Surface-finish measurement on nonferrous materials

B. Piper, W. P. Callis. *Am Machinist* 1959 Vol 103 (16) pp 105-120 (Aug 10)

The need for closer control of non-ferrous surface quality prompted this survey of present-day techniques, commercial instruments, and ways of defining surface finish. The qualitative method of determining average surface condition is adequate for a broad evaluation, but the single-parameter measurement of roughness, with perhaps one other characteristic, is generally preferred. The multi-parameter method, evaluating such factors as waviness and flaws in addition to roughness, is the most thorough. 16 illustr.

D *Bff Cz Unf*

Adjusting optical and mechanical profilographs for measuring the waviness of surfaces

M. M. Palei. *Izm tekh* 1959 Vol 20 (2) pp 16-17 (Feb); *Library of Congress Mthly Index Russ Access* 1959 Vol 12 (3) p 878 (June) (Original in Russian)

W *Cx Wgfb*

A non-interferometric measurement of the surface roughness

J. Goetz. *Jemna Mechanika a Optika* 1959 (8) pp 257-262 (In Czech, abstr in English)

Fundamental conceptions for surface roughness measurement are discussed and individual methods of qualitative testing and quantitative measuring of the surface quality are expounded and evaluated. The error in the use of the contact profilometer is considered, and the principles of the interpretation of profile curves are explained with particular reference to the centre line system. 14 illustr, 15 ref.

A *Unf Vs.21*

USP 2,867,149 (Oct 5, 1953) **C. T. Goddard, Bell Telephone Labs Inc**

Method of determining surface flatness

The measurement of the flatness of coated cathode surfaces by optical flats is not feasible because of the granular texture of the carbonate coated surface. Exact measurement is, however, required, as the ratio of cathode length to permissible departure from flatness is 7,000 : 1. This flatness must be held for thousands of hours of operation at the order of 1,000 deg K. The problem has been solved by sending parallel rays of light through a grating of fine wires or ruled lines positioned at an angle to the surface to be measured which then appear as alternate bands of dark and light regions on the surface viewed from directly above the surface. If the surface is flat, the bands will be straight, if the surface is stepped, the bands will appear stepped, and if depressions are in the surface, the bands will be bowed, *ie* the dark bands will provide a linearly magnified picture of the cross section of the surface under test. A grating of 300 to 1,000 lines/inch is convenient for determining departure from flatness of the order of 0.0003 to 0.0001 inch. (4 claims, 7 illustr). Ref cited : 5 USP ; 1 BP.

J *Cz.545*

MISCELLANEOUS

Micro-path magnetic tape control system for machine tools

Topp Industries Inc, Inglewood, Calif. *Machinery* (London) 1959 Vol 95 (2441) pp 326-328 (Aug 26)

4 illustr. *W* *Pr Wpb*

Machine tools—the key to technical progress. Werkzeugmaschinen—Schluessel zum technischen Fortschritt

E. Waldmeyer. *Technica* 1959 Vol 8 (18) pp 879-883, 891-892, 894, 899-901 (Aug 28) (In German)

The earliest tools were simple flint chips, and many developments have been made in progressing from those to the modern tools and the machines on which the tools are used. Such tool materials as synthetic diamond were unknown in the last century. The most outstanding names in the history of machine tool development are : John Rennie, Henry Maudsley, Josef Clement, Joseph Whitworth, and James Nasmyth. With the introduction of tools armed with sintered carbide inserts or impregnated with diamond, machine tools are still progressing towards greater efficiency. (To be concl). 23 illustr.

A *N.131/Pdc.131/Pr.131*

Standardization of tool and gauge design

T. A. Vvedenskii. *Standartizatsiia* 1959 Vol 23 (3) pp 28-30 (Mar); *Library of Congress Mthly Index Russ Access* 1959 Vol 12 (4) p 1101 (July) (Original in Russian)

W *Pd Qb.255/Tz:Qb.255*

Ways for specialization in the cutting tool industry

E. P. Yufa, M. A. Dymshits. *Vest mash* 1959 Vol 39 (3) pp 76-77 (Mar); *Library of Congress Mthly Index Russ Access* 1959 Vol 12 (4) p 1096 (July) (Original in Russian)

W *Pd.25*

The production of the Simca Aronde

Anon. *Machinery* (London) 1959 Vol 95 (2440) pp 252-270 (Aug 19)

Methods and equipment employed for the manufacture of pistons in the new works at Poissy. 22 illustr.

W *Agg Ceq.1456/Agg Ceq.26*

USP 2,872,327 (Oct 25, 1954) **K. M. Taylor, Carborundum Co**

Refractory bodies containing boron nitride and a boride, and the manufacture thereof

The bodies consist essentially of boron nitride and boride selected from the group of zirconium, titanium, molybdenum, chromium, carbon, and mixtures of such borides, in an amount of 20 to 99% (weight) of the body. The material may be used for making abrasives. (13 claims). Ref cited : 1 USP ; 1 BP.

J *Ba.13.545*

FP 1,170,648 **L. Nussbaum**

(Apr 6, 1956—conv date, Gt Britain)

Method of manufacturing articles of hard metal carbides. Procédé de fabrication de pièces en carbures de métaux durs

A mixture of 70 to 40% of powdered crystals of hard metal carbides, mainly titanium carbide, and 30 to 60% of a powdered metal mixture forming the bond and containing 40 to 65% iron, the remainder being made up of 15 to 40 parts nickel, 5 to 20 parts chromium, 5 to 20 parts manganese, and the inevitable impurities, are heated sufficiently to form a liquid metal alloy bond penetrating the interstices between the carbide particles so that on cooling the carbide crystals are finely distributed in the bond which surrounds the larger carbide particles. This distribution increases the mechanical resistance to impact. The articles produced have good abrasive properties and are useful for percussion drilling. Reference is made to FP 1,136,161. (3 claims).

J *Bkc Qc.545*

PUBLICATIONS RECEIVED

BOOK REVIEW

A simple guide to prospective exporters

The Gauge and Tool Makers Association, Standbroom House, Old Bond St, London W 1. 1959, 18 pp. Price : 3s 6d

Tool manufacturers wishing to enter the export market are recommended to obtain a copy of this GTMA publication. It deals briefly and clearly with such matters as appointing an agent, methods of exporting, enquiries and quotations, methods of payment, and export credit facilities.

W *251.52*

TRADE LITERATURE

Reinforced resinoid products

Bay State Abrasive Products Co, Westboro, Mass. 18 pp, 8½ × 11 in., illustr

Recommends specifications and gives basic information on characteristics and applications of raised hub disk wheels, abrasive cut-off wheels, and reinforced resinoid straight wheels. Accessories available include adaptors and back-up pads for use with raised hub disk-wheels. *D* *Pe Urb.57*

Condensed catalog of Bay State Abrasive Products

Bay State Abrasive Products Co, Westboro, Mass. 14 pp, 8½ × 11 in., illustr

As well as general information on abrasive and bond types, recommended specifications for different grinding operations are given. Illustrations show standard wheel shapes. Particulars are included of other abrasive products, such as blades and wheels for masonry cutting and finishing, and of accessories used in grinding. *D* *Pe.57*

Mounted wheels and points

The Carborundum Co Ltd, Trafford Park, Manchester 17. 19 pp, 5½ × 8½ in., illustr

Silicon carbide, 'Aloxite' aluminium oxide, and 'Fabraflex' mounted wheels and points, for use with high-speed portable grinding machines, are offered in a comprehensive range of standardized shapes and sizes. A major advantage claimed is their ability to reach places inaccessible to larger wheels. The particular application of each abrasive type is explained and full order specifications given. *D* *Pe Rj.57*

Collected catalogues [Carbolap abrasives]

The Carborundum Co Ltd, Trafford Park, Manchester 17.

Carbolap hand hones are a low cost product for honing tungsten carbide, HSS, stellite, and ceramics. They are a handy size—less than 6 in. long—and are suitable for removing the fine, weak cutting edge produced by finish grinding or diamond wheel lapping. Mesh sizes 180, 220, 360, and 500 are produced.

Carbolap off-hand lapping wheels are 6 in. diameter × 1 in. thick × 1¼ in. hole, ¼ in. rim × ¼ in. coating depth. They are produced in 180, 220, 320, and 600 mesh sizes. They can be used wet or dry on all cutting tool materials. *W* *Pgk.57*

Diamond tooling for modern industry. L'outillage diamante pour l'industrie moderne

Compagnie du Diamant Industriel, Place de la Gare, Chennevières-sur-Marne (Seine-et-Oise), France. 6 pp, 8½ × 10½ in., illustr (In French)

Milling cutters for optical work on CMV, Optibel, Dunand, Technaphot, etc, machines; disks for slicing glass, Pyrex, quartz, marble, porcelain, etc; wheels for machining hard substances; and drills of different types for a variety of work, are produced by the company. *A* *N.57*

Paladin fine grinding materials

Paladin Slijpmaterialen, Vondelkerkstraat 18, Amsterdam. 4 pp, 5½ × 7½ in., illustr

Paladin, a synthetic crystalline abrasive of a hardness between that of ruby and diamond, is used closely cemented to a solid metal core for fine grinding and finishing. Grinding tools come in many dimensions and shapes, and can be made in any form for special purposes. Advantages claimed are cheapness, efficiency, high-polish, and greater precision. *D* *Rdf.57*

Diamond bits for turbo drill operations

Christensen Diamond Products, 1937 S 2nd West, Salt Lake City, Utah. 4 illustr, 8½ × 11 in., illustr

This report describes field tests in which diamond bit-turbo drill combinations drilled over 1,800 ft under varied conditions, and results are compared with performance of rotary rock bit-turbo combinations. The major remaining problem is to reduce costs: turbo drill rental adds 40 to 60% to rig cost while drilling, and increased fluid requirements add to pump maintenance and fuel costs. To off-set these expenses, improved penetration rate and footage/bit is essential. Although penetration rate increases of diamond drill bits have been generally only 1.3 to 1.6 of rotary drill bits, the former have been very successful in improving footage. The turbo has ample power to provide the necessary higher penetration rates and thus it seems that diamond bit performance will depend on hydraulic improvements and certain modifications in the diamonds themselves and their matrices. If these changes can be made successfully, diamond bit-turbo drilling will almost certainly find broad application throughout the drilling industry in the near future. *D* *Cfbd Nh.57*

Dia-Dusco Specification Charts and Price List

Diamond Dust Co Inc, 77 Searing Ave, Mineola, LI, NY. 4 pp, 8½ × 11½ in., illustr

Tables show grades and applications of diamond powders and compounds, and give their prices. *D* *Km.513.57*

DoAll Microtom-Atic

The DoAll Co, Des Plaines, Ill. 4 pp, 8½ × 11 in., illustr

The DoAll Microtom-atic machine for slicing and dicing of brittle, hard, or friable materials, is available in three models and provides an efficient machining method for transistor production, critical parting operations, and for preparation of metallographic test sections. Qualities claimed are vibration-free, precision operation, smooth fracture-free cuts, and uniform wafer thickness. The machine is designed for rapid interchange of the necessary fixtures. Diamond blades are used for the cutting and dicing operations. *D* *Ba Ceg Nt.57*

TRI-Y the new design solid drilling bit for more footage and faster penetration

Drilling & Service Ltd, Basingstoke, Hants. 4 pp, 8 × 10 in., illustr, (mimeographed)

A diamond drilling bit has been designed which, it is claimed, solves the problem of 'coring out'. The new bit actually cuts a small core, and then, by a combination of hydraulics and bit design, breaks this off in small segments which are washed through the cut-out slot. Details are given of bit performance in tests. *D* *Nhb.57*

For metallurgical work J-D polishing machines

E. W. Jackson & Son Ltd, Cheswold Works, French Gate, Doncaster. 20 pp, 5½ × 8½ in., illustr

The latest models of machines for polishing metallographic specimens and for precision lapping of small parts are described and illustrated. Both those with twin and single tables are entirely self-contained and have electric drives built into the design. Specifications are given for various features of the machines, including a paper fixing device. Abrasive paper disks, cloth disks, and bakelite bonded disks are also supplied and advice is given on lubrication. A table shows approximate speeds. *D* *Bfa Chm Pr.57*

Collected catalogues [Diamond dies, etc]

Hermann Keller KG, Herborn/Dill, Schleissfach 112, Germany. (In German)

The diamond drawing dies are tested to obviate shattering of the stone during use, and the diamond is set in a sintered surround under very high pressure. Weights of stone vary from 0.12 to 2.00 carats. Sintered carbide drawing dies and matrices are also made in many varieties. Herkel diamond truing tools are made to suit six sizes of wheel, the smallest with a diameter up to 100 mm and width up to 10 mm, and the largest with a diameter up to 600 mm and width up to 150 mm. The diamonds vary from 0.35 to 2.00 carat.

A *Nj.57/Nkb.57/Tbb.57*

Collected catalogues [Abrasives and media]

Scientific Abrasives, not Inc, PO Box 234, Park Ridge, Ill.

Loose information sheets cover a range of grinding aids. These include 'Fast Cutting' lapping compound base (without abrasive) for drip application; diamond compound 'J', synthetic sapphire compound 'J', and boron carbide compound 'J'—which give a good range of mesh size and hardness for precision polishing; a crystal lapping compound base, particularly suitable for piezo-electric crystals; 'Fast Cutting' lapping compound with 1 micron synthetic sapphire grit; and 'Water Solvent', recommended as a coolant for diamond wheels. A variety of other coolants, lapping vehicles, and abrasives, is described, particularly the 'Polistick' buffing stick, which is a special finishing tool, and which is available in either synthetic sapphire or diamond.

W *Rd.57*

For gun drills . . . sharpening fixture and point checking gage

National Twist Drill and Tool Co, Rochester, Mich. 4 pp, 8½ × 11 in., illustr

The National gun drill sharpening fixture can be mounted by magnetic chucking, clamping, or bolting. Simple adjustment permits grinding of point angles ranging from 0° to 45°, and relief angles up to 20°. The fixture is squared with the grinder table, the angles are set on the calibrated scales, and the drill is clamped against the locating block. Four different locating blocks come with each fixture.

Also available is a point checking gauge for gun drills which checks both point angles and the offset of the point. The gauge is supplied with three blades for checking the following combinations of point angles: 15° × 15°, 23° × 13°, and 42° × 20°. Special angles can be supplied on request.

W *Albz Chc Wbh.57*

PATENT LISTS

BRITISH

The Official Journal (Patents) 1959 (3677) (Aug 6)

821,157 SIGAAR, J. Manufacture of jewellery.

The Official Journal (Patents) 1959 (3678) (Aug 12)

821,510 SIMMONDS AEROCESSORIES LTD. Cutting elements.

821,511 SIMMONDS AEROCESSORIES LTD. Rotary cutting or abrading tools.

821,596 HARTMETALLWERK IMMELBORN VEB. Highly wear-resistant material comprising alumina and heavy metal carbides and process for the production thereof.

The Official Journal (Patents) 1959 (3679) (Aug 19)

821,703 CRANE PACKING CO. Lapping machines.

821,718 WICKMAN LTD. Electro-erosion of metals.

821,809 BEYER-OLSEN, A. Polishing or grinding wheel.

The Official Journal (Patents) 1959 (3680) (Aug 26)

822,363 ASSCHER'S DIAMANTNIJVERHEID NV. Process for the manufacture of diamond from graphite.

822,058 SUPER-CUT INC. Grinding wheel.

822,370 JONES & SHIPMAN LTD, A. A., and HOULDSWORTH, J. Diamond dressing of grinding wheels.

822,216 OK TOOL CO INC. Cutting tools comprising bits and holders therefor.

UNITED STATES

Official Gazette 1959 Vol 744 (1-4) (July)

2,893,171 H. A. SILVEN, NORTON CO. Grinding machine.

2,893,173 W. H. BATEMAN, WICKMAN LTD. Means for forming the teeth of spur gear wheels or the like.

2,893,181 W. P. BURROUGHS, GENERAL MOTORS CORP. Hydrogen elimination in treatment of metals.

2,893,372 E. A. RICHARDSON. Heat exchange apparatus.

2,893,854 R. C. RINKER, A. a. H. W. SCHNABEL, ARMOUR & CO. Coated abrasive article and method of manufacture.

2,894,360 C. C. ALVORD, NORTON CO. Grinding machine-wheel wear compensating mechanism.

2,894,504 E. A. TINTINGER, O. R. CLAWSON. Valve seat stone dresser.

2,894,726 E. M. WEAVER, J. L. STOCKARD. Drilling bit.

2,895,261 L. DAY, J. DOBRICK, A. KAY, SPITFIRE TOOL AND MACHINE CO INC. Conditioning ring holding apparatus for lapping machines.

2,895,265 O. E. HILL, NORTON CO. Grinding machine.

2,895,384 M. L. BAXTER jun, L. O. CARLSEN, GLEASON WORKS. Machine for cutting gears and the like.

2,895,385 L. O. CARLSEN, GLEASON WORKS. Feed mechanism for a machine for cutting gears and the like.

2,895,612 L. V. WISE, G. BUERGEL, BULOVA RESEARCH AND DEVELOPMENT LAB INC. Automatic crystal measuring and sorting apparatus.

2,896,377 H. WALKLING, SHUMAG SCHUMACHER METALLWERKE GmbH. Centreless-grinding machines for cylindrical workpieces.

2,896,477 H. C. MILLER, SUPER-CUT INC. Method of mounting diamonds in tool shanks and other holders.

2,896,605 C. O. THOMPSON, PHILCO CORP. Tools.

2,896,914 M. A. RYAN, PHILLIPS PETROLEUM CO. Thermal drill and drilling process.

2,897,074 C. A. REDFARN. Manufacture of abrasive articles.

2,897,076 A. M. SUGA, SIMONDS ABRASIVE CO. abrasive article.

SOUTH AFRICAN

Official Journal 1959 Vol 12 (26-29) (July)

782/59 L. A. HANSEN, J. H. BAKER, E. J. KEYES, NORTON CO. Manufacture of coated abrasives.

59/1147 A. GUEUSSIEUR, SOC D'ELECTRO-CHIMIE, D'ELECTRO-METALLURGIE & D'ACIERIES ELECTRIQUES D'UGINE. Method of making mine drills with coiled independent cutting edges.

AUSTRALIAN

Official Journal 1959 Vol 29 (21-24) (June-July)

221,885 NORTON CO. Abrasive polishing element (add to 200,403).

221,909 SOC GENEVOISE D'INSTRUMENTS DE PHYSIQUE. Machine tool.

222,065 COMMONWEALTH INDUSTRIAL GASES LTD. Arc erosion.

222,180 BRITISH TIMKEN LTD. Lapping roller bearing races.

SWISS

Patentliste 1959 (12-13) (June-July)

339,376 R. L. WEAR, R. L. BOWMAN, MINNESOTA MINING & MFG CO. Self-hardening liquid product for impregnating and embedding electrical coils and also for bonding abrasive granules on supports and method for its manufacture.

339,386 A. RASDOW. Method of measuring the profile of a workpiece and arrangement for carrying out the method.

339,527 A. FEZER. Grinding device on decorticating machines for the grinding of the decorticating knives of a cutter head.

339,528 W. PHILLIPS, B. M. PHILLIPS, E. H. PHILLIPS, E. D. PHILLIPS, J. B. PHILLIPS. Multi-focal lens, method for its manufacture, and arrangement for carrying out this method.

339,529 R. A. MAHLMEISTER, SHEFFIELD CORP. Method for profiling a ribbed grinding wheel and ribbed grinding wheel produced by the method.

339,530 L. O. CARLSEN, W. C. CRITCHLEY, H. PEDERSEN, GLEASON WORKS. Machine for grinding toothed workpieces.

339,556 A. CASTIONI. Method of drilling a block of a mineral material and device for carrying it out.

339,705 H. FLAD, W. KNOLL, L. MEURER VON INFFELD, SIMILI, FABRIK FEINER SCHLEIFPRODUKTE. Jewel consisting of transparent non-precious material.

339,792 E. LORETAN, PARECHOC SA. Shock-absorbing bearing for small mechanical movements, in particular for measuring apparatus.

339,823 H. E. BALSIGER, LANDIS TOOL CO. Machine tool, in particular for copying machines for non-cylindrical workpieces.

339,884 A. VOGT, PERUHAG SOC COMMERCIALE & AGENCE DE BREVETS D'INVENTION. Method of faceting hour signs in relief on ornamental pieces.

FRENCH

Bulletin Officiel Vol 76 (3922-3924) (July)

1,196,818 OTNIMA MASCHINENFABRIK GmbH, OTNIMA-WERK GUTHSCHLAG & CO GmbH. Method and apparatus for finishing the tooth flanks of straight and helicoidal gear wheels.

1,196,823 SA SOUDURE ELECTRIQUE LANGUE-PIN. Electric circuits for spark machining.

1,196,962 NV PHILIPS' GLOEILAMPENFABRIE-KEN. Device for superfinishing a shaft.

1,197,050 SIMMOND AEROCESSORIES LTD. Cutting or abrading tool.

1,197,184 A. SEDLACEK. Method of manufacturing cutting and polishing tools.

1,197,208 SA SOUDURE ELECTRIQUE LANGUE-PIN. Method of manufacturing electrodes for spark machining and electrodes so obtained.

1,197,878 SANDVIKENS JERNVERKS AB. Tool holder.

1,197,934 L. R. DAVIDSON. Method and machine for the mechanical finishing of workpieces.

1,197,943 ATELIERS DES CHARMILLES SA. Electrode and device for securing it in a machine for electrical machining.

1,197,944 ATELIERS DES CHARMILLES SA. Device for controlling the position of an electrode in a machine for machining by electro-erosion.

1,198,314 A. GRAFER, H. NUSSE. Device for double spindle drilling, in particular for work in mine ends.

1,198,576 HUGHES TOOL CO. Method and machine for drilling tunnels.

GERMAN

Patentblatt 1959 Vol 79 (30-33) (July-Aug)

Applications Open to Public Inspection

1,062,567 H. KRUG, DISKUS WERKE FRANKFURT a MAIN AG. Clamping device for detachably securing grinding members to their supporting disk.

1,062,569 E. VOLKMAR, BEB FRAES- UND SCHLEIFMASCHINENWERK. Automatic feeding device for grinding carriages of grinding machines having measuring control by means of workpieces leaving the machines.

1,062,689 H. WOREL, M. U. K. TORKAR, DEUTSCHE GOLD- UND SILBER-SCHEIDEANSTALT VORMALS ROESSLER. Method of making α-aluminium oxide.

1,063,484 A. TATAR. Device for grinding drills, in particular for grinding four faces.

1,063,589 G. CLARKSON VINCENT, ICI LTD. Method of making practically pure aluminium oxide.

1,063,769 A. BOHLE, FA JOSEF BOHLE. Glass cutter.

1,063,770 T. HOFMAN, C. W. HOFMAN. Device for cutting spectacle lenses.

1,063,923 C. KLINGSPOR. Grinding or polishing roller.

Patents Granted

972,550 M. WILLE, FA H. C. STARCK. Method of making carbides, borides, and silicides of the heavy metals and mixtures of such compositions.

972,573 C. KLINGSPOR. Method of making grinding bodies.

ABSTRACT NOTIONS

Trade literature for you . . .

Trade literature reviewed in *Industrial Diamond Abstracts* is *not* available on loan. Readers wishing to obtain copies should contact the manufacturer whose address is shown at the beginning of the review.

. . . and for us

In order that readers may be kept informed of developments in the industrial diamond and allied industries, manufacturers are requested to send review copies of their trade literature to: Industrial Diamond Information Bureau, 2 Charterhouse Street, London EC 1.

Loan Service requests

The Loan Service operated by the Information Bureau is very widely used by firms and individuals in the United Kingdom, so much so that it is not unusual for several requests to be received for the same article. If users of the Loan Service will ensure that borrowed periodicals are returned within the specified 15 days, it will reduce the delay for those on the waiting list.

A short cut . . .

Our librarian receives many requests from America for the originals of articles that have appeared in the American trade papers. A delay is thus caused as the librarian has to contact the American journal concerned in order to pass on the request. Two trips across the Atlantic could be avoided if American readers would apply direct to the journal in which they are interested.

Addresses

Readers are reminded that it is in their interest to keep the Information Bureau informed of any changes of address.

IDR REPRINT SERVICE

The following Reprints are now available from Industrial Diamond Information Bureau, 2 Charterhouse Street, London EC 1, at a charge of 1s each, post free :

C 98—The resistance of diamond to abrasion, by E. M. Wilks and J. Wilks (*Phil Mag* 1959).

I 252—A new method of determining the average shape of diamond and other particles, by J. F. H. Custers and F. A. Raal ; A counting device for diamonds, by F. A. Raal, (*IDR* 1959).

I 253—Factors affecting the efficiency of resinoid-bonded diamond wheels, by R. G. Weavind (*IDR* 1959).

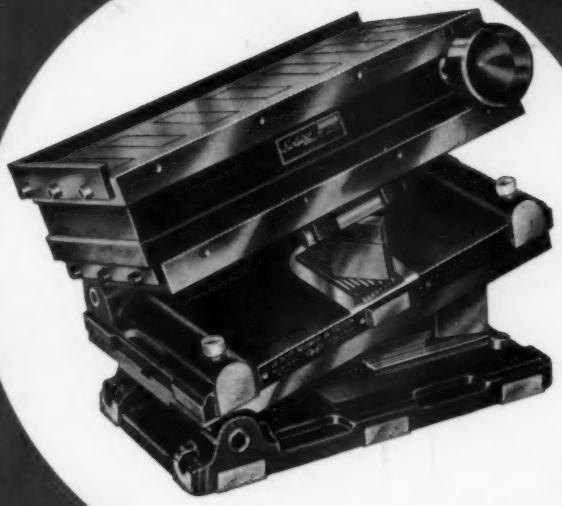
FROM EVERY CONCEIVABLE ANGLE

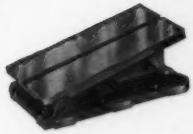
THE 'HABIT' REGD

UNIVERSAL COMPOUND ANGLE

SINE TABLE

Provides a Greater Degree of Accuracy

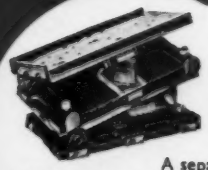




A base unit hinged on its short side

Centres to fit the base unit, to enable cones, etc., to be accurately inspected

A truly universal Sine table consisting of Units which can be used in combination or singly as required. Sturdily built to withstand all normal machining strains on grinding machines, jig borers, light drilling operations, engraving, etc., etc.



A separate table hinged on the long side which can be fitted to the base unit. Dowels are provided for accurate alignment.

HABIT DIAMOND TOOLING LIMITED

LURGAN AVENUE, LONDON, W.6 · TELEPHONE FULHAM 7944

Telegrams HABIT, LONDON, W.6

a journal for precision engineers and all users of industrial diamonds and other hard materials

INDUSTRIAL DIAMOND REVIEW

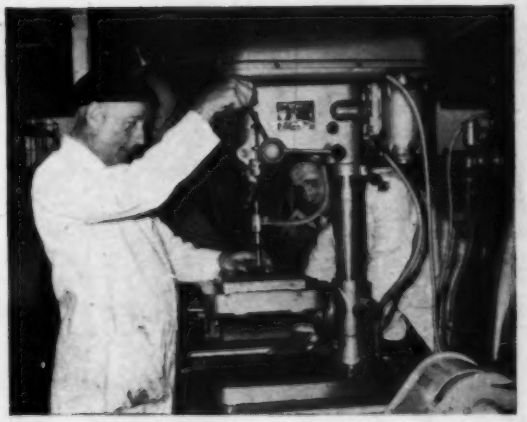
incorporating INDUSTRIAL DIAMOND ABSTRACTS

MONTHLY 1/3 SUBSCRIPTION 15/- A YEAR

October, 1959 Vol. 19 No. 227

a DEMONSTRATION?

IF YOU CUT, drill or grind glass, ceramics, carbide or any known hard material the Neven Mobile Unit will demonstrate most efficient production methods with diamond tools. May we send this Demonstration Unit to your works? The Sales Manager would be pleased to advise you when the Unit will be in your area.



IMPREGNATED DIAMOND PRODUCTS LTD OF GLOUCESTER

JW1 TELEPHONE 21164 (3 LINES) · TELEGRAMS IMPREG GLOUCESTER

IDP